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Natural History Magazine

No. 17 JANUARY, 1931 *Vol. III*

NEW SPECIMENS PRESENTED BY THE ROWLAND WARD TRUSTEES.

By J. G. Dollman, B.A., Assistant Keeper, Department of Zoology.

The Museum has lately received as donations from the Rowland Ward Trustees several specimens of considerable interest; these have been mounted in the Rowland Ward Studios, and among them the following are of special note.

1. A Midas tamarin (*Mystax midas*) from Para. The tamarins are a group of small monkeys related to the marmosets, from which, however, they are distinguished by the absence of ear-tufts. This is the well-known orange-footed species found in the Guianas and is probably identical with the rufous-handed tamarin (*Mystax rufimanus*) described by E. Geoffroy St. Hilaire from French Guiana. The Midas tamarin is a close ally of the Negro tamarin (*Mystax ursulus*) from the Lower Amazon, but the latter species is easily distinguished by the fact that the hands and feet are black, not orange or yellowish as in *Mystax midas*.

2. A black howling monkey (*Alouatta caraya*) from Paraguay. The howling monkeys were first recognized as a generic group by Lacépède in the year 1799, when the name *Alouatta* was bestowed upon them. The name *Mycetes*, of Illiger, although better known than *Alouatta*, was not published until twelve years later and is therefore antedated by Lacépède's name.

These howlers or howling monkeys are some of the largest of the South American apes and are remarkable for their heavy build and small facial angle. In the males the lower jaw is greatly enlarged to accommodate the inflated hyoid bones forming the vocal resonator by means of which the voice is very greatly augmented. The tail has a naked, prehensile tip and is largely used in climbing. The brain, which is small, is of a very low type and would appear to indicate that these monkeys are some of the most primitive of the New World species. The various members of the genus are spread over a large part of tropical America, from Guatemala to Paraguay.

Some of these monkeys are exceptionally beautiful in colour: the red howler (*Alouatta senicula*), for instance, displays a vivid mixture of golden yellow and deep chestnut tints. Other species are brownish-red (*Alouatta ursina*), and the males of the black howler (*Alouatta caraya*) are deep black in colour. The females of this latter species, to which sex the present specimen belongs, are straw-coloured, washed with black; the young of both sexes are entirely straw-coloured, the males gradually assuming the dark tint as they grow older until when fully adult they are quite black.

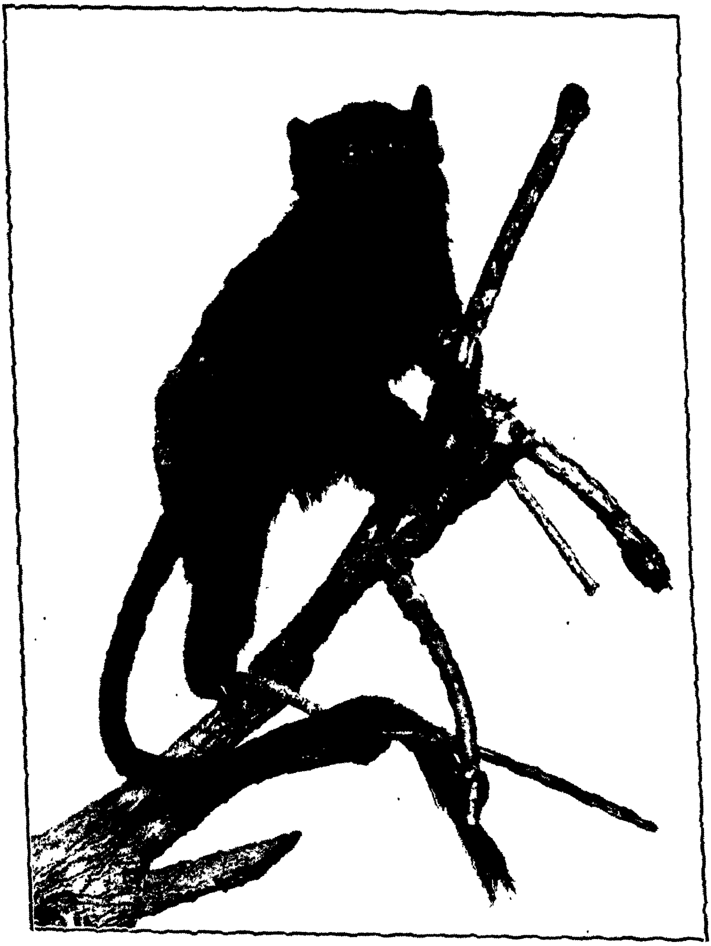


FIG. 1.—MIDAS TAMARIN.

The black howler extends further south than any other species of *Alouatta*, being found in southern Brazil, Paraguay, and Bolivia. The cry uttered by the males of these monkeys is quite astounding in volume and far-reaching in effect. It is recorded of the Guatemalan species, or "mono" (*Alouatta villosa*), that the voice can be heard in thick forest country at a distance of two miles, and in more open surroundings it is clearly audible at nearly twice that distance.

3. A black saki (*Chiropotes satanas*) from Para. Formerly the black saki and the red-backed saki (*Chiropotes chiropotes*) were classified with the typical sakis in the genus *Pithecia*, but the name *Chiropotes* has recently been revived to embrace these two monkeys, which differ widely from the true sakis of the genus *Pithecia*. In these monkeys (*Chiropotes*) the tail is non-prehensile, long, and very bushy, and a thick beard and whiskers

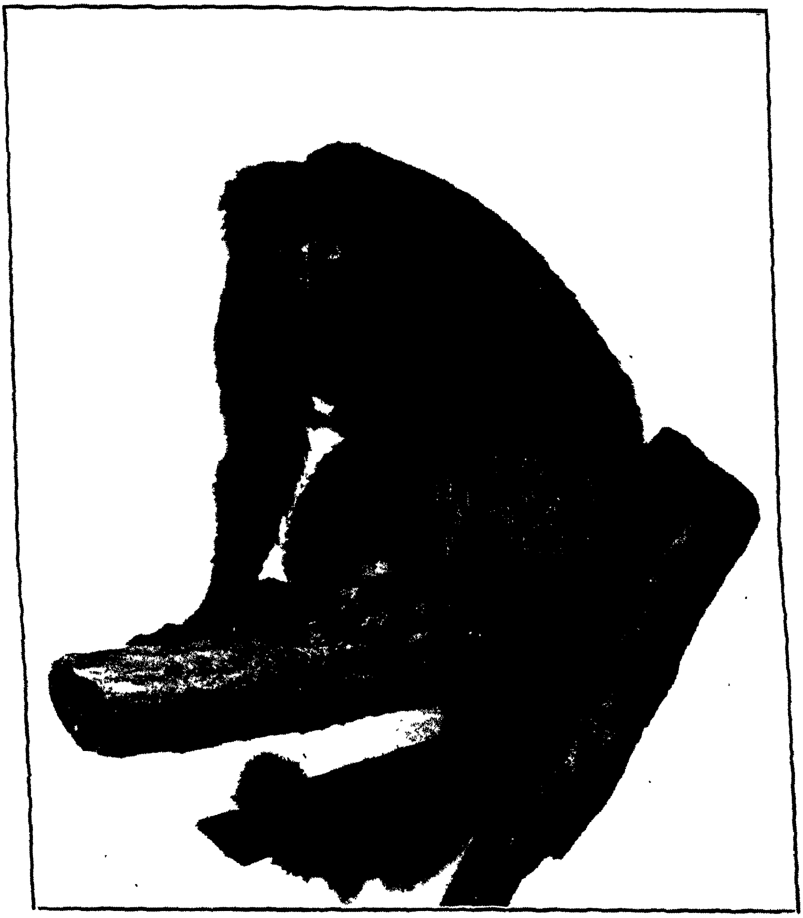


FIG. 2.—BLACK HOWLING MONKEY.

are developed in the male sex. The hair on the crown of the head is divided by a central parting and looks as though it had been carefully brushed. The incisor teeth in this genus and *Pithecia* project forward to a marked degree, the inner pair of teeth being large and the outer pair quite small. The angle of the lower jaw is expanded, but less so than in the howling monkeys.

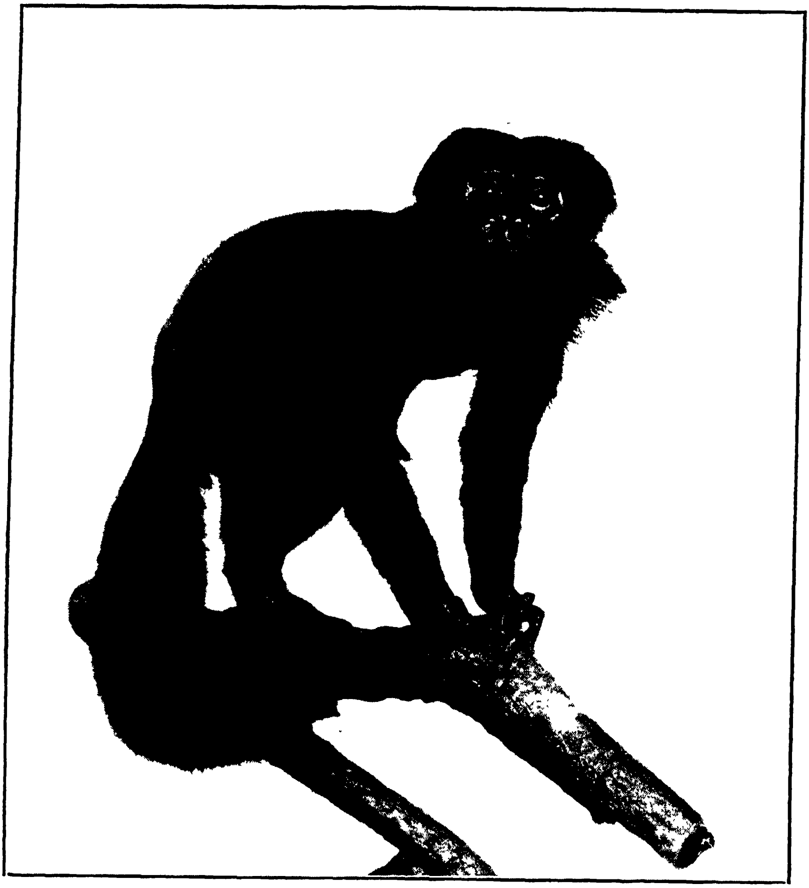


FIG. 3.—BLACK SAKI.

The black saki varies a good deal in general colour; sometimes it is black and shiny, sometimes the coat is tinged with brown or grey. The females are always browner on the back, and in young specimens the beard is either absent or very rudimentary and the hair on the crown of the head radiates from a central point. This species is found over a large area of the

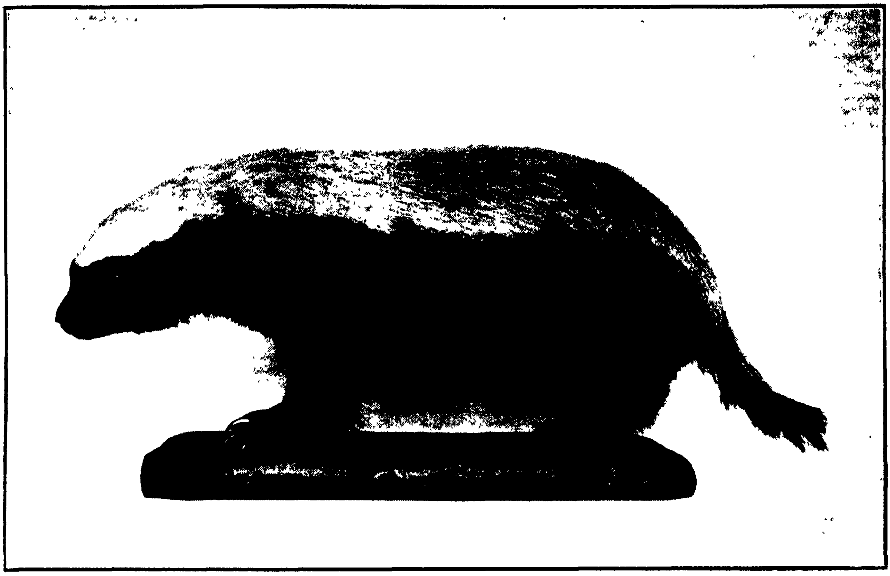


Fig. 4.—Ratel.

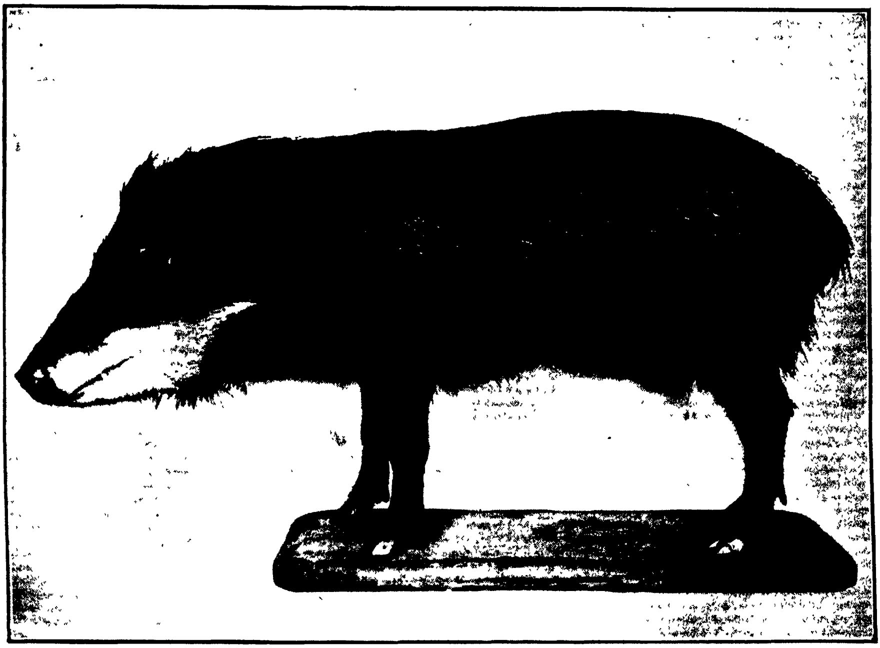


Fig. 5.—White-lipped Peccary.

Lower Amazon, ranging throughout British Guiana, Para, and along the Rio Orinoco.

The closely allied red-backed saki (*Chiropotes chiropotes*) is very similar to the black saki, but differs in having the back reddish-brown in colour and the hands and feet orange-coloured; it inhabits much the same country as the black species and is, no doubt, a very close ally of that form. Both these monkeys differ from the true sakis in having the coat of a woolly texture, whereas in *Pithecia* the hair is long and harsh.

4. A ratel (*Mellivora ratel*) from Kenya Colony. The ratel or honey-ratel is in appearance very like a badger, to which animal it is closely related. In form it is massive and very thickset; the average length of the head and body is about 32 inches, and the short, stumpy tail rarely exceeds 6½ inches. The colour of the coat is suggestive of the badger type, being greyish or whitish above and black below, usually with a fairly well developed white line of demarcation between the two tints, this line running from the head down the flanks to the root of the tail. The face, limbs, flanks, belly, and greater part of the tail are black. The fore-limbs carry very large and powerful claws, which are used by the animal when burrowing.

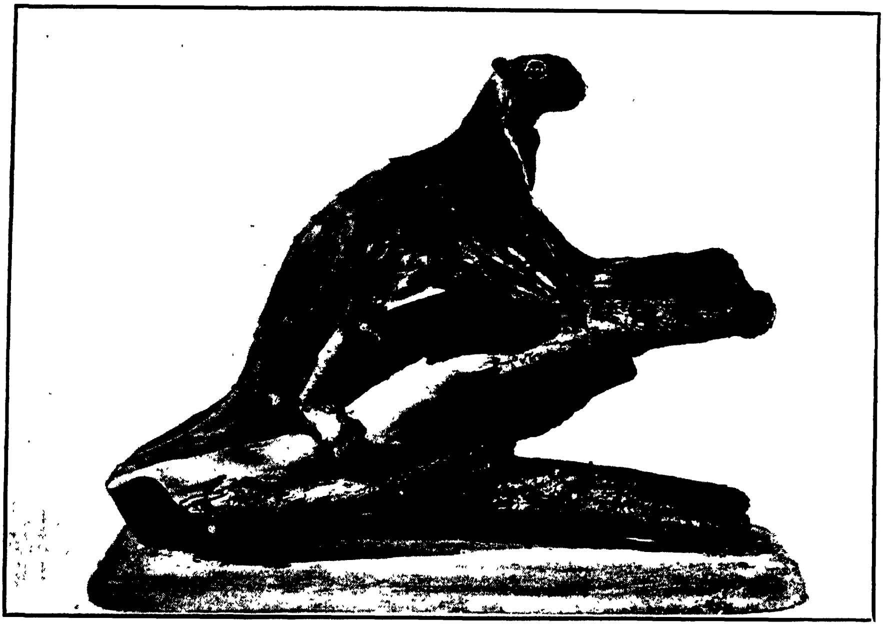


FIG. 6.—FLYING "LEMUR."

The ratel is found over a great part of Africa from south of the Sahara to Cape Colony, and in some districts it is extremely plentiful. The ratel also has a wide distribution in India. Although a comparatively common animal, this beast is, owing to its nocturnal habits, but rarely met with. It inhabits rocky districts and frequently has its lair among roots of trees or in a hollow tree. It feeds very largely on honey, but is practically omnivorous, eating snakes and sometimes raiding poultry farms. Owing to the great thickness of its skin it can attack bees' nests, while in search of honey, with impunity. It may be regarded as a dangerous animal when hard pressed, as it can bite very savagely, and further is able to defend itself like a skunk by emitting an offensive fluid.

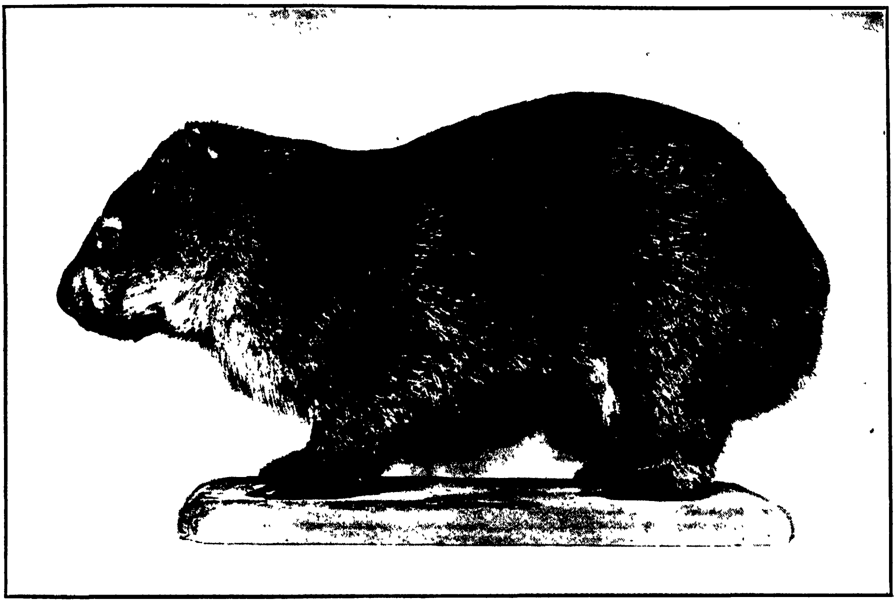


Fig. 7.—Naked-nosed Wombat.

5. A white-lipped peccary (*Dicotyles pecari*) from Santa Catharina, Brazil. The peccaries are classified as a sub-family (*Dicotylinæ*) of the family *Suidæ* or pigs. They differ from the true pigs (*Sus*) in having only three complete toes instead of four on each hind foot, in the possession of only 32 teeth instead of 44, and in having the upper canine teeth short and directed downwards, whereas in the pigs these teeth are usually of considerable size and curve upwards or outwards. Other

differences are the possession of a dorsal gland, a complex stomach, and the presence of only two teats instead of the six pairs found in the typical pigs. Furthermore, the peccaries are provided with only a rudimentary tail, whereas in the pigs the tail is well developed. The pigs and their close allies (that is, the bush-pigs, forest-hogs, wart-hogs, and babirusa) form a group by themselves called the sub-family *Suinæ*, the members of which are confined to the Old World. The peccaries, or *Dicotylinæ*, are, on the other hand, found only in the New World, where they range from Arkansas and Texas southwards to the Rio Negro in Patagonia.

FIG. 8.—GOLIATH FROG, PHOTOGRAPHED WITH COMMON FROG.

There are two quite different types or sub-genera of peccaries: firstly, the white-lipped peccaries representing the sub-genus *Dicotyles*, in which the mane and dorsal crest are long, and the bony palate of the skull is of considerable breadth; and secondly, all the remaining species of peccary which form the sub-genus *Pecari*, in which the mane and dorsal crest are shorter and the palate is comparatively narrow. The white-lipped peccaries, three forms of which are now recognized, are distributed over a large part of Central and South America, from Mexico to Paraguay; members of the sub-genus *Pecari* are still more widely distributed, the range being co-extensive with that of the genus. Two species and about ten sub-species of the *Pecari* group are now recognized, the various forms differing chiefly in the colouring of the light shoulder stripe. The present specimen represents the typical white-lipped peccary or " wari " (*Dicotyles pecari pecari*), from British Guiana, Paraguay, and Brazil; the other two races are *Dicotyles pecari ringens* from Mexico and *Dicotyles pecari spiradens* from Costa Rica.

In general dimensions the white-lipped peccaries are larger than the members of the *Pecari* or tajacu group, the head and body measurement being as much as from 40 to 46 inches, whereas in the sub-genus *Pecari* the average length is only about 36 inches.

6. A flying " lemur " (*Galeopterus temminckii*) from Borneo. This species is new to the Exhibition Galleries, where the genus is represented by one adult and a young specimen of the Malayan and Javan form, *Galeopterus variegatus.*

7. A naked-nosed wombat (*Phascolomys mitchelli*) from New South Wales. Five species of wombat are now recognized, three having naked noses and two having the nose hairy. The naked-nosed species are *Phascolomys mitchelli,* from south-eastern Australia, *Phascolomys tasmaniensis* from Tasmania, and *Phascolomys ursinus* from Flinders and Deal Islands, Bass Strait. Of these *Phascolomys mitchelli* is the largest, the hind-foot measuring from 95 to 105 mm. in length, whereas the Tasmanian species has a hind-foot measurement of 75 to 80 mm., and in the Flinders Island wombat the hind-foot averages only 65·5 mm. The two hairy-nosed species are the southern hairy-nosed wombat (*Phascolomys latifrons*), in which the hairy nose is white in colour and the fur grey, and the Queensland hairy-nosed wombat (*Phascolomys gillespiei*), from South Queensland, in which the nose is brown and the fur fawn-coloured. The present specimen is a valuable addition to the Exhibition Galleries, since this species has not hitherto been exhibited.

8. A Goliath frog (*Rana goliath*) from the Cameroons. The Goliath frog is the largest frog in the world, attaining a length of 12 inches exclusive of its very powerful limbs.

The skeleton of this frog has also been presented by the Rowland Ward Trustees, thus adding considerably to the scientific value of the specimen.

BALL-ROLLING BEETLES.

By GILBERT J. ARROW, Deputy Keeper, Department of Entomology.

THE Insect world provides few more curious sights than that of the ball-rolling Beetles of Southern Europe, Africa, and the East in the performance of their remarkable task. It is very generally supposed that the ball so persistently propelled along the ground contains an egg and that the object is to ensure in some way the future of the insect's offspring; but this is not the case. No doubt some species of *Scarabœus* and *Gymnopleurus*, the two principal genera whose members have this habit, transport in that way the food intended for their young; but the egg is deposited after and not before rolling the ball, and the object is to propel this to a suitable spot in which it can be buried, after which it is, in most cases, consumed in peace and security.

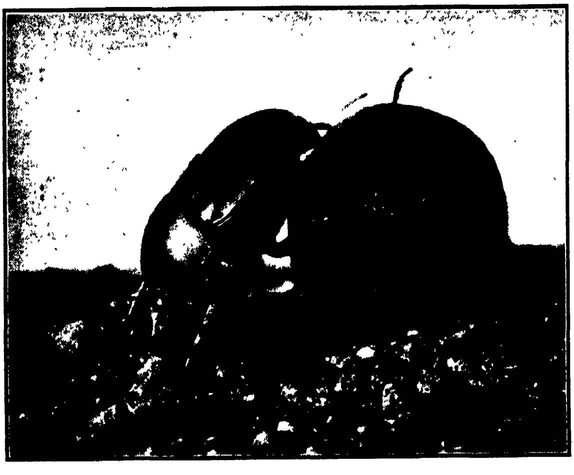


FIG. 1.—THE SACRED BEETLE (*Scarabœus sacer*) engaged in pushing its ball. Natural size.

It is not unusual to see two beetles engaged upon a single ball. In some cases these are the male and female, which co-operate in rolling it, the female invariably pushing from behind, while the male pulls in front. In the Sacred Beetle, *Scarabœus sacer*, of Egypt, the most celebrated of the ball-rollers, and those most nearly related to it, there is no such harmonious co-operation and, if two individuals are seen with a single ball, one of them is a robber, trying to secure a treasure to which it has no rightful claim.

To produce the proper spherical shape the material, generally consisting of the droppings of domestic animals, is first moulded by means of the head and legs, the insect turning its body in all directions and operating with such skill and precision that a very few minutes suffice to produce the finished article. When the ball is intended to provide food for the young, it is lowered into a subterranean burrow and there opened by the mother-beetle; the lips of the incision are spread out and, after a single egg has been deposited, brought together over it in such a way that an air-chamber is enclosed, sufficient communication being left with the exterior to ensure the circulation of air while preventing the access of intruders. This operation changes the globe into a pear-shaped object.

The egg increases considerably in size after it is laid. The grub which hatches from it proceeds immediately to devour the substance surrounding it, but always leaves a shell which serves as a cocoon within which it undergoes its transformations.

The bodily adaptations which fit these beetles for the performance of their various tasks are very interesting. In order to shape a perfect sphere between the legs it is necessary that the body should be short and the legs an equal distance apart. For dividing the material and digging the burrow the head is flat and spade-like, and the fore-legs are provided with strong teeth. The manipulation of the ball requires that it should roll easily and at the same time be held so that it cannot roll away and be lost. It is therefore encircled by the hinder legs, which are curved, and gripped by the flexible five-jointed feet, while at the same time it is pushed along by pressing the fore-legs and head against the ground. The long teeth with which both of these are provided enable the insect to get a firm hold of the ground and at the same time reduce the friction and wear caused by contact with it. Most remarkable adaptation of all, to reduce further such friction and resistance the feet normally belonging to the fore-legs are completely absent. In no other group of beetles are any of the feet missing.

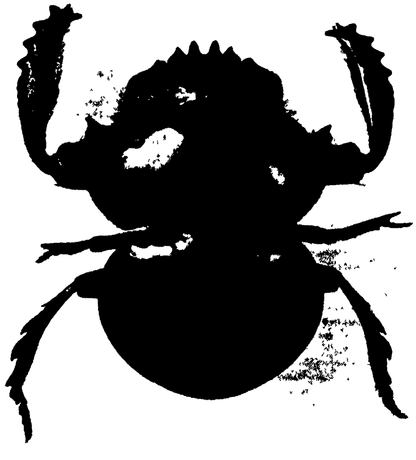


FIG. 2.—*Mnematium cancer*. Natural size.

The modification of bodily structure for this purpose has perhaps reached its extreme limit in the second form here represented, *Mnematium cancer.* The photograph shows the only known example of this insect, a specimen of uncertain origin in the Natural History Museum. It is of very large size, and the fore-part of the body, containing the muscles used in the performance of its functions, is immensely developed in comparison with the hind-part. It will be seen that, in place of feet, the fore-legs bear only very small terminal spurs. The hind legs, by which the moving ball is grasped, are of moderate length, while the middle legs are, in comparison, absurdly short.

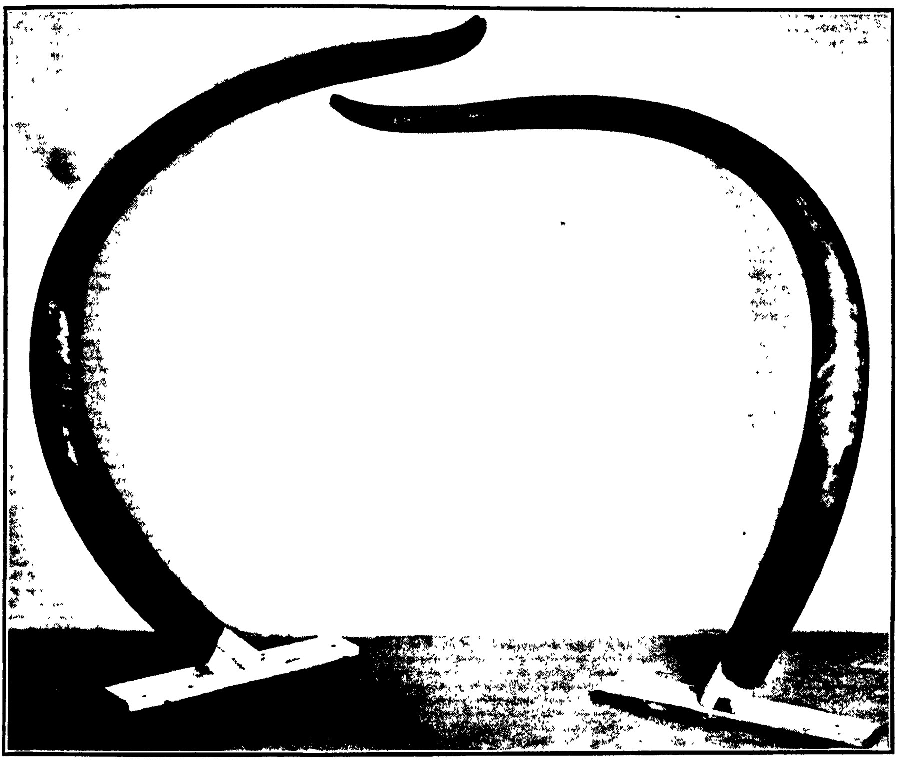
Most of these beetles are very active on the wing, travelling rapidly to any spot where their food is to be found. In *Mnematium,* however, the faculty of flight has been sacrificed for the sake of increased efficiency in other directions. The wings, like the fore-feet, have disappeared. The wing-covers are much reduced and incapable of being raised, and the shoulders, which should contain the wing-muscles, are rounded off, so that much more freedom of movement than usual is possible between the front and hind parts of the body. The very short rounded hind-part and the great size of the fore-legs produce a crab-like appearance, which is expressed in the name *cancer* that has been given to this extraordinary insect. Its habits can only be inferred from its structure, as no record of any kind exists concerning the unique specimen. The species has probably a high degree of skill in burrowing and may be a native of one of the less-known regions of Africa, such as Angola. We must hope that in due course it will be rediscovered and information obtained by actual observation as to its mode of life.

FOSSIL IVORY

By A. Tindell Hopwood, M.Sc., Assistant Keeper, Department of Geology.

Somewhere about ten thousand years ago the Great Ice Age in Britain came to an end, and with the disappearance of the ice the Mammoth ceased to be a member of the British fauna. It retreated to high latitudes, where it persisted until a much later date. In the end, however, it became totally extinct, so that all we know of it now is limited to what we can glean from the bones and other remains dug up out of the ground, supplemented by occasional lucky finds of a more or less complete corpse in the frozen ground of the extreme north of Siberia.

Even though the Mammoth is no longer living it still is of economic importance because of the value attaching to the tusks. These are nearly all obtained from the New Siberian Islands by Tunguses and Yakuts. The natives visit the islands in the early spring, and do most of their collecting in the second half of May. The tusks are bound on sledges drawn by dogs, by which means they are transported to the traders' outposts; there they are exchanged for store goods. The rate of exchange varies in the different districts, but it is a flat rate per tusk. Good, bad, and indifferent, all the tusks in a parcel have to be accepted.



Mammoth Tusks in the Department of Geology.
In this position they form an arch 7 feet high.

The traders bring the tusks back to such centres as Yakutsk, whence they are sent to the various ivory markets. Most of the tusks eventually find their way to London, the largest ivory market in the world. After a sale by auction they are cut up and turned to various commercial uses. Some, the best, are used for billiard balls, others for knife handles, powder boxes, toilet sets, or piano keys, and those which are good for no other purpose are burnt for the carbon they contain, which is used in the preparation of the pigment known as Ivory Black, as well as in drawing inks with a carbon base.

The size and weight of a tusk varies considerably. The largest of which I have any record is in the Museum of the Academy of Sciences in Leningrad. It is of a pair from a skull obtained by a trader from the cliffs of the Kolyma River. The left tusk measures 13 ft. 7 in., and weighs 185 lb.; and the right 12 ft. 9 in., and weighs 166 lb. A pair recently acquired for the Geological Department of this Museum approaches this record very closely. The right tusk is 12 ft. 5 ins. long, and the left just over 12 ft. 9 ins.; between them they weigh 356 lb. Another large tusk in the galleries of the Geological Department is 11 ft. 4 in. long. The pair came from the "Lena River District," and the single tusk from Bolshoi Lyakhov, one of the New Siberian Islands. Two small, slender tusks are still in position in a skull from the frozen ground of "Siberia." They are 6 ft. 4 in. long. This skull is of especial interest, because it retains shreds of the sinews and tougher tissues of the muscles. On the floor of the same case is another slender tusk which shows the poor state of preservation of the majority of specimens.

Other frozen tusks are found in Alaska. One brought back by Captain Beechey from Kotzebue Sound is 12 ft. 6 in. long, and 23 in. in its greatest girth. Curiously enough, the tusks from Alaska are not sufficiently well preserved to be of commercial value.

Compared with the modern African and Indian Elephants the Mammoth was a small animal, as a rule not more than nine feet high at the shoulder. His tusks were large in comparison, and the average was bigger than that of either of the modern species. The maximum weight of an Indian tusk is 116 lb., whereas an unusually large pair of African tusks in the Natural History Museum are 9 ft. 2¾ in., and 9 ft. 2½ in. long, and weigh between them 334 lb. The maximum weight of an African tusk is 226½ lb.

AN OLD-FASHIONED BULL-TERRIER.

By J. G. DOLLMAN, B.A., Assistant Keeper, Department of Zoology.

IN 1929 the Museum received as a donation from Mr. A. V. Allan a specimen of an old-fashioned type of bull-terrier; this dog has recently been remounted in the Rowland Ward Studios and photographs of the specimen and of a modern bull-terrier are here published for comparison.

Mr. Allan speaks of the dog as having been a pet of his father's, and after its death, over fifty years ago, it was preserved in a glass case. As will be seen from the photograph, this old-fashioned breed is very different from the modern bull-terrier, both in colour and form. In the past bull-terriers were much more like bull-dogs than terriers (the two progenitors of the breed), and the majority of the dogs appear to have been, like this specimen, "patched." The evolution of the all-white dog, with its longer head, is of comparatively modern date and very largely due to the efforts of the late Mr. James Hinks of Birmingham. Although the bull-dog and terrier played the largest part in the origin of the bull-terrier, there can be little doubt that pointer and Dalmatian blood had some share in the evolution of the breed, while certain dogs show traces of the greyhound or whippet.

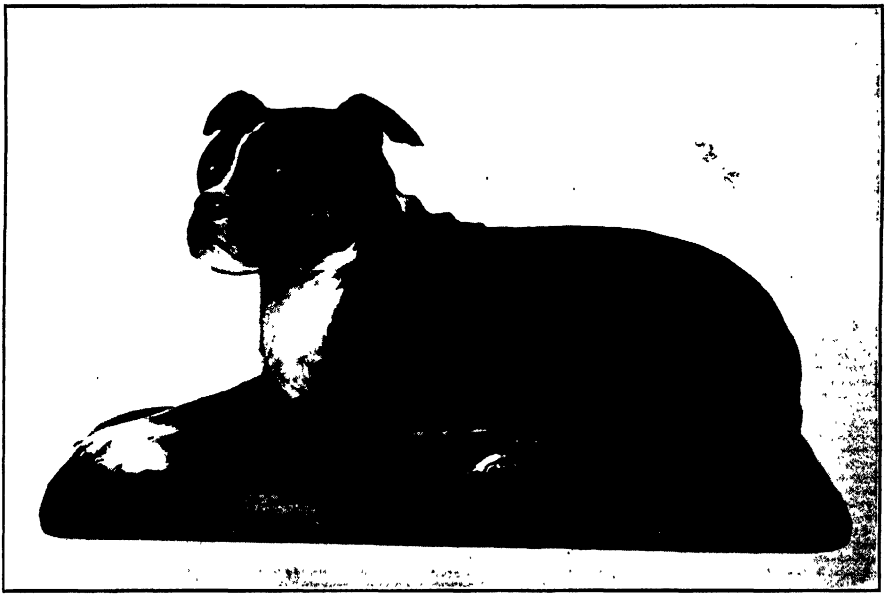


FIG. 1.—OLD-FASHIONED BULL-TERRIER.

The old-fashioned bull-terrier was essentially a fighting dog, and as such its ears were usually cropped; this process was continued until 1895, when such mutilation was prohibited by the Kennel Club. These dogs were largely used in the rat-pit, for dog-fights, and badger-baiting, pursuits which were formerly considered to be of a sporting nature. The use of this breed for such purposes led to its falling into disrepute and it is only recently, with the assistance of dog-shows, that the bull-terrier has come into its own.

The colour of Mr. Allan's dog is sable and tan with a white streak on the forehead, white waistcoat and patch on the neck, and it has white mittens on the fore-feet; the tan markings are confined to the sides of the face, eye-brows and lower extremities of the limbs. Nowadays bull-terriers are usually entirely white, the " patched " dog having disappeared, although brindled specimens and dogs with black or brindled markings are by no means rare.

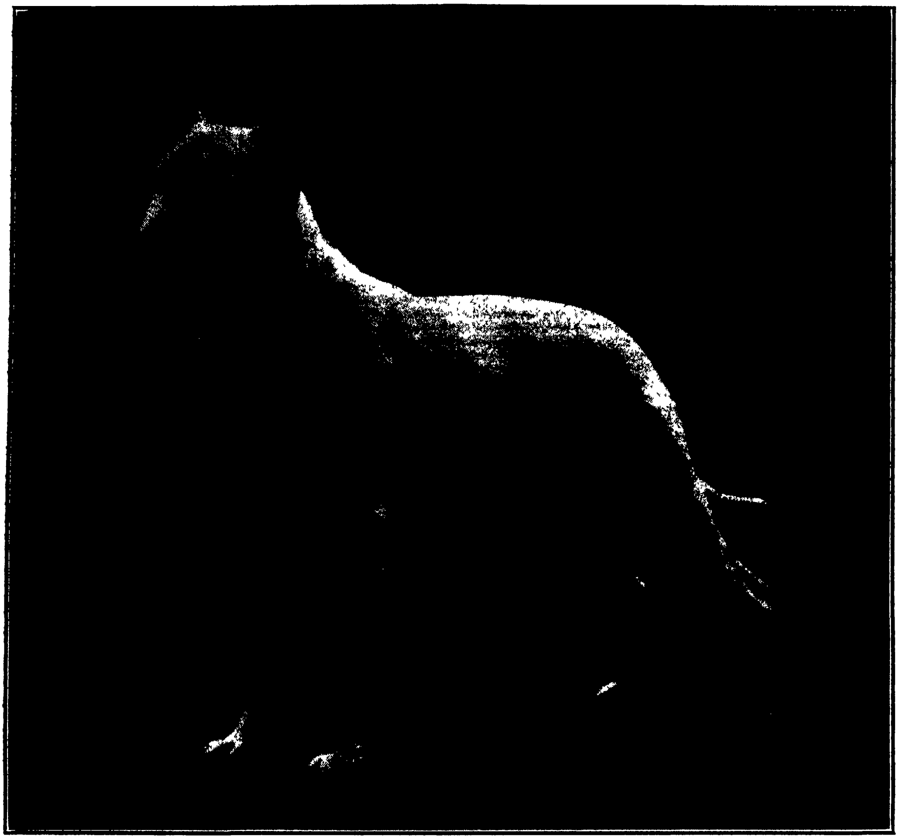


Fig. 2.—"Regent Pluto." All-white Bull-Terrier.
(Bred and owned by Dr. G. M. Vevers.)

The so-called " toy " bull-terrier, a specimen of which is exhibited in the North Hall, is a small breed of the bull-terrier which usually develops an apple head and goggle eyes, the result being far from pleasing.

JESUITS' BARK.

By J. RAMSBOTTOM, O.B.E., M.A., Keeper of Botany.

THE tercentenary of the use of Cinchona bark by Europeans has been celebrated this year (1930) both in America and this country. The celebrations in London have been on a very large scale and were organized by Dr. H. S. Wellcome and his staff at the Wellcome Historical Medical Museum, where a remarkable exhibit of historical material is on view. The more important material in the Department of Botany is represented by replicas, and is shown as a temporary exhibit in the central hall at South Kensington.

The story of *Cinchona* is fascinating no matter from which aspect it is viewed. As is to be expected, the how and when of the discovery of this " natural cure " for fever is uncertain. It is not known whether the South American natives were aware of its properties before the conquest of their country by Pizarro (1513–33). Most of the writers who have considered the matter believe that the Indians must have had this knowledge, though many think it was known only locally or perhaps restricted to certain sections of the people. On the other hand, others believe that the use of the bark was unknown before the arrival of the Spaniards. The absence of authentic information has been regarded as due to the secrecy of the Indians or its destruction by the Spaniards; but it has been pointed out that it is not in general use amongst the Peruvian Indians at the present time and is not found in old tombs, as was the Coco herb.

There is no lack of romance, both ancient and modern, accounting for its discovery: Indians learned of the medicinal properties of the bark by seeing sick " lions " or pumas eat it; a Spanish soldier sick of fever and left to die drank of the water in which a *Cinchona* tree had fallen and soon recovered sufficiently to carry on; or it was an Indian who drank of the water of a lake into which *Cinchona* trees had been blown by an earthquake and was miraculously cured. Such legends are to be expected and it is not surprising that one or other of them occasionally is taken seriously.

The history of the discovery has been discussed by several speakers during the recent celebrations. The usual account and the one which has decided the year 1930 as the tercentenary is given by Clements Markham in his " Travels in Peru and India " (1862). " In about 1630 Don Juan Lopez de Canizares, the Spanish Corregidor of Loxa, being ill with an intermittent fever, an Indian of Malacotas is said to have revealed to him the healing virtues of quinquina bark, and to have instructed him in the proper way to administer it, and thus his cure was effected." When the Vicereine, the Countess of Chinchon, became ill in 1638 he introduced the treatment to her, and she brought some of the bark when she returned to Europe in 1640. It seems highly probable, however, that the value of the bark was known to Europeans before 1630. J. de Jussieu, who accompanied La Condamine on his expedition (1737–43) to measure the arc of a meridian in South America, and acted as naturalist amongst other activities, states that in the year 1600 a Jesuit priest was cured of ague by bark given to him by an Indian cacique, and La Condamine found a manuscript in a library at Loxa which stated that Europeans used the bark about that time.

It is not possible to say how de Jussieu fixed the date, but it is known that members of the Jesuit mission (dating from about 1560) knew the use of the bark about that period; it then appears to have been known as "Loxa bark." The Viceroy, Count Chinchon, arrived in Peru with his second wife, Francisca Henriquez de Ribera, in 1628, and later both suffered acutely from fever. In 1638 the Court physician, Dr. Juan de Vega, cured the Countess by administering Cinchona bark. She immediately became its advocate and caused large quantities to be distributed, partly by the Jesuit fathers. For this reason it became known as "Countess's powder." The generic name given to the plant by Linnæus in 1742—*Cinchona*—is usually supposed to have been in honour of the Countess, and much has been made of the supposed misspelling: Linnæus, however, had a pretty wit in name-coining and it is not unlikely that he made play with her name and the native name of the plant, *Quinquina*, which, following La Condamine, he had previously used.

Apparently the bark was first brought to Spain and to Italy by Barnabe de Cobo in 1630. Further supplies were brought by Count Chinchon and de Vega in 1641: the Countess had died a short time previously. The use of the bark spread to the Low Countries and other parts of Europe. De Cobo's successor as Procurator of the Peruvian mission, Bartholeme Tatur, brought large quantities to Europe on his return, and, passing through France on his way to Rome, is said to have cured the Dauphin (afterwards Louis XIV) of the ague. Arriving in Rome he naturally was in close contact with Cardinal de

Lugo, Cardinal Protector of the South American Missions, who immediately took the liveliest interest in the matter and had some of the bark analyzed by G. Fonseca, the Pope's physician. The report proving favourable, the Cardinal until his death in 1660, was the chief advocate of the efficacy of the bark and is said to have had it generously distributed among the poor at the financial cost of the rich. Consequently it became known as " Cardinal's powder " or " Lugo's powder."

The close association of the Jesuits with the cure did not allow of a reasonable estimation of its medicinal qualities. Fierce discussions took place, but all too frequently the claims for or against its value depended on a Catholic or Protestant outlook. The use of the bark became known in England in 1655; copies of the newspaper *Mercurius Politicus* of that year contained the advertisement: " The feaver bark, commonly called the Jesuites Powder, which is so famous for the cure of all manner of Agues, brought over by James Thompson, Merchant of Antwerp, is to be had either at his own lodging at the Black Spread-Eagle in the Old Bailey over against Black and White Court, or at Mr. John Crooks, Bookseller at the Ship in St. Pauls Churchyard, with directions for its use. Which Bark or Powder is attested to be perfectly true by Doctor Prudjean and other eminent Doctors and Physitians who have made experience of it." Several papers were written about this time on the properties of the bark, but for many years its name acted against its becoming popular. In 1677 it appeared in the London Pharmacopœia as *Cortex peruvianus.* Sir Robert Talbor gained fame by his method of administering the bark with other ingredients (Talbor's powders), being appointed Physician-in-Ordinary to Charles II in 1678 and knighted: the following year he cured the king of malaria and shortly afterwards was sent by him to France to treat the Dauphin. Successful in this he sold his secret to Louis XIV on condition that it was not to be revealed till after his death. It was published in France in 1682 and immediately translated into English: " The English Remedy: or his (Talbor's) wonderful Secret for cureing Agues and Feavers."

Although the bark was well known there seems to have been some doubt about the botanical characters of *Cinchona.* John Evelyn in his Diary for August 7, 1685, says, " I went to see Mr. Watts, Keeper of the Apothecaries' Garden of Simples at Chelsea, where there is a collection of innumerable rarities of that sort, particularly, besides many rare annuals, the tree bearing Jesuits' bark, which had done such wonders in quartan agues." Nothing further is known of the Chelsea plant. In the collections of the Department of Botany there is a specimen of *Cinchona officinalis* from Philip Miller's herbarium. Miller was appointed gardener at Chelsea Physic Garden in 1722, and we know that dried specimens of the early plants were kept—and that one of the conditions of Sir Hans Sloane making over the Garden to the Apothecaries' Society in 1722 at a nominal rental of £5 was that fifty herbarium specimens annually should be presented to the Royal Society. No data are given on the herbarium sheet, and there is thus a remote possibility that the specimen may be from the tree Evelyn saw : there is no specimen among the tributary specimens which are now in the Department.

The botanical reference to the bark in John Ray's "Historia Plantarum" (1688) is : "Arbor febrifuga Peruviana China Chinae & Quinquina & Gannan peride dicta, Hispanis Palos de calentura, Cortex arboris Cortex Peruvianus vulgo dicitur, inque pulverum redactus Pulvis Patrum [Sci. Jesuitarum] & Pulvis Cardinalis de Lugo. Angl. The Jesuits' Powder."

The account is mainly concerned with the medical history of the bark.

Sir Hans Sloane was an advocate of the use of the bark, and owing to his eminence played a considerable part in obtaining proper recognition of its properties. His catalogue of barks has a reference to Jesuits' powder and three to bark—"The Jesuits' bark from the Island of Providence"; "China Chini, Guinana peribe, Jesuits' bark, China China"; and "The Bark of ye Tree w^{ch} ye Malabars call Ette and w^{ch} I think to be ye Jesuits' bark but not colected in a good time nor from a large flourishing tree." The last specimens are of considerable interest because of the reference to Malabar : it remains to be proved whether they are Cinchona bark, and if so whether there is any additional evidence that the plant was introduced so early into India. In Sloane's herbarium there are two plants referred to Ray's *Arbor febrifuga Peruviana* and a third number is crossed out. All three plants are from L. Plukenet's herbarium and are given in his "Almagestum Botanicum" (1696) as *Agerato affinis Peruviana frutescens*, and also figured but with an idealised fruit.

This is *Iva frutescens*, which according to Britton and Brown's "Illustrated Flora of the Northern United States, etc." (1913) has the popular names marsh elder, high-water shrub, Jesuits' or false Jesuits' bark. It is remarkable that Sloane should have been mistaken in referring Quinaquina to this species, and the fact that it is mentioned in the Oxford

Dictionary as False or Bastard Jesuits' Bark suggests that the mistake was not uncommon.

That there was confusion, probably caused by the use of native names, is also shown by a letter from John Hawkins (for some time in the employ of Sir Hans Sloane) to Sir Joseph Banks written in 1794 concerning two engraved plates " arvore da Quina Quina " he had made in 1731.

SIR,

My son acquainted me that you wish'd to know the origin of the engrav'd plate of the Jesuits bark you have in your possession.

Doctr. C. Mortimer in 1740, then Secretary of the Royal Society (my relation) was a correspondent of Monsr. de la Condamine's, who being then in Peru, sent the Doctr. a present of a Serone of Bark (I think it was so called) wh. might be about half a Hundred Weight, pack'd up in a Bullocks hide, in wh. was enclosed several specimens of the Jesuits bark tree, also some large peices of the wood with the Bark on, and some specimens of an uncommon form'd branch of a Tree which he called Quinaquina; together with its Almond like seeds.

I being then an Apprentice in London, having pleasure in the Study of Botany, drawing Plants, &c. Doctr. Mortimer gave me the several Specimens that I might form a drawing to be engraved for the Royal Society. The specimens were crumpled up, but by soaking them in warm water, I got them expanded so as to form an exact representation, as the plate shows.

I also made a drawing of the uncommon form'd specimen, with the triangular stalk with thick farinaceous winged leaves set on every side: wh he called Quina Quina, the drawing of wh I enclose for your acceptance; a foul copy of the same I gave to Mr. Lambert with descriptions of both; I also send, for your perusal, a letter from Dr. Dillenius, with whom I used to correspond on Botanick matters, as it alludes to the present subject, on the other side I have transcrib'd Monsr. Condamines description of the first Quinaquina.

I am Sir Your most Obedient
Humble Servt.
JOHN HAWKINS.

Dorchester, Feby. 8th 1794.

The plate shows three drawings; the specimen with the triangular stem; transverse section of stem and leaves; seeds which are of *Myroxylon*, the Peruvian Balsam. It is of interest to note that according to Pavon's labels the native name for *Myroxylon punctatum* (*Myrosperum balsamiferum*) is Quino Quino.

The transcription from La Condamine reads:—

"There is another famous tree known in several provinces of America under the name of Quina Quina; a famous Balsam distills from that tree, by means of an incision: the seeds called by the Spaniards Pepitas de Quinaquina, have the form of beans, . . . their chief use is to make fumigations. This Tree grows in plenty in several Provinces of high Peru. . . .

"Amongst the several virtues attributed to this Balsamic Tree, wh has ever been called Quina Quina by the Natives, and afterwards by the Spaniards, the most considerable is that of the Bark, wh passed for an excellent febrifuge. This, before the discovery of the Tree of Loxa, was in great repute for curing tertian Fevers, & the Jesuits of La paz, or Chuquiabo, gather'd its Bark very carefully, wh is of the utmost bitterness; & were used to send it to Rome, where it was distributed under its true name of Quinaquina, & was used against Intermitting Fevers. The Bark of Loxa having passed in Europe & at Rome by the same way; The new febrifuge has been confounded with the Old one, & that of Loxa having prevailed, it has retain'd the name of the first, wh nowadays is almost entirely forgot. The name of Cascarilla or small bark, wh has been given to that of Loxa, seems likewise to have been invented to distinguish it from another, wh was undoubtedly that of the antient Febrifuge." *

Cinchona officinalis is the species which was first known, but the genus is widely spread in the rain-forests of the Andes from Bolivia to Colombia. The number of species accepted by botanists is roughly fifty. *C. officinalis* is pale bark or crown bark (because of it being reserved for the Royal Pharmacy at Madrid). Other species were soon exploited, and we find references to the efficacy of "red," "yellow," and other barks. So early as 1735 Ulloa called attention to the likelihood of the failure of *C. officinalis* unless steps were taken to reafforest, and in 1792 Fée proposed its cultivation as a plantation crop; and these were not the only ones to realise the peril, though others mainly urged the growing of *Cinchona* in other regions. La Condamine and de Jussieu attempted to transport living plants, but after bringing them 2000 miles lost them by a wave in the Amazon. They tried also to raise seeds in French Guiana without success.

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* *Cf.* also Ruiz's title, "Description of the Tree known in the kingdom of Peru under the name of Quinquino, and of its Bark, called Quinquina, which is distinct from the Quino or cascarilla."

The Spaniards meanwhile began to explore their South American possessions more thoroughly from a botanical point of view and much information about the species of *Cinchona* was gained. José Celestino Mutis was sent out by King Carlos III of Spain in 1761 and worked for forty years on his flora of New Granada. He found several new species of *Cinchona* and was in correspondence with Linnæus, to whom he sent specimens. His collections are at Madrid; his manuscript of "Instrucion sobre las Quinas" is in the Department of Botany.

The best known of these Spanish botanical explorers is Hippolito Ruiz Lopez, who was sent out to South America by King Carlos in 1777, accompanied by José Pavon, and José Dombey who was deputed by the Court of France. A Royal decree declared the object of this expedition to be "The examination and methodical knowledge of the natural productions of the American dominions, not only to promote the progress of the physical sciences, but to clear up doubts, and detect adulterations in medicine, dyeing, and other important arts; to augment commerce, to form herbaria, and collections of natural productions, and to enrich the cabinet of natural history, and the botanical garden belonging to the Court." For eleven years Ruiz explored Peru and Chili in a most arduous manner, and the results were of outstanding value: unfortunately much material was lost owing to shipwreck and to fire. Several new species of *Cinchona* were discovered; many of the type specimens of these are in the Department of Botany and numerous samples of bark. These were acquired for the Department by Robert Brown, the first Keeper of Botany, at the sale of the effects of Aylmer Bourke Lambert in 1842. Lambert, an amateur botanist and for many years vice-president of the Linnean Society, is well known for his work on *Cinchona* (1797; 1821) and on *Pinus;* the originals of the illustrations to his "Description of the genus *Cinchona*" by Ferdinand Bauer, one of Sir Joseph Banks's artists, are in the Museum copy of the work. In addition to Ruiz and Pavon's plants the following manuscripts of Ruiz are in the Department: Compendio historico-medico-comercial de las Quinas; Reparos y reflexiones criticas sobre la Memoria de la Quina; Experimentos Quimicos sobre las Quinas; Causas por que las Calenturas intermitentes no cortandose en los primeros accesos pasan à malignas y contagiosas; Estampas de Quinas, No. 6; Razon de las siete especies de Quina; as well as the descriptions of the plants collected during the expedition. Apparently Lambert bought barks and plants from Pavon, for there are invoices for their purchase. The entry in the sale catalogue reads:

> 103. Ruiz and Pavon's magnificent Herbarium, as arranged and mounted by Mr. Lambert, in the large cabinet, with 3 additional bundles.
>
> ⁂ This most important and invaluable collection embraces from 1500 to 1750 species. A Cabinet with Drawers, containing about 75 small boxes of dry Fruits, belonging also to Ruiz and Pavon's Herbarium (see Prof. D. Don's description of this collection in the Appendix to Lambert's Genus Pinus)
>
> of the Palmæ there are about 16 species
> ,, Laurinæ ,, ,, 11 ,,
> ,, Myristicæ ,, ,, 7 ,,
>
> and a large number of other very interesting specimens, and sundry sections of woods; also a Box containing about 30 specimens of Cinchona and other Barks, and the original Manuscript, which came into Mr. Lambert's possession at the same time, viz. Ruiz (H.) and J. Pavon's Original Manuscripts, in Spanish, of their Voyages, Travels and Botanical researches in Peru and Chili, 1777–88, consisting of their Journals, Lists and Descriptions of the Plants, Insects, &c. of Peru and Chili, a large quantity, filling a mahogany box 20 inches by 15; also a box containing a quantity of miscellaneous Fruits and Seeds.

The price paid was £270.

In 1820 P. J. Pelletier and J. B. Caventon isolated quinine from Cinchona bark. Other alkaloids are present, which are not so antiseptic as quinine, the most important being quinidine, cinchonidine and cinchonine. Different barks have different proportions of alkaloids.

About a century ago many were alarmed at the increasing difficulty of obtaining Cinchona bark and the certainty of the supply failing. J. F. Royle, for example, urged the East India Company to take up the growing of *Cinchona* on at least three occasions.

The French were the first to attempt to acclimatize the plant in the last century as they had been in the previous one, being urged to it mainly by H. A. Weddell; planting was tried in Algeria, but failed, though plants had been raised from his seed both in Paris and at the Royal Horticultural Society's garden at Chiswick. Similarly, the first Javan attempt with Weddell's seedlings was not successful (1852), but in 1855, 20,000 trees were raised from a collection of seeds from Charles Ledger—which had been offered to the British Government. Sir Clements R. Markham was sent in 1859 by the India Office to the Eastern Andes to collect *Cinchona* and to superintend its acclimatization in India: this was done successfully and plantations were established on the Nilgiri Hills and in Ceylon. Thomas Anderson was sent to Java in 1861 to study Dutch methods, and, bringing back plants and seeds, started the Government plantations at Darjeeling. In connection with the successful British attempt the work of R. Spruce and R. Cross deserves mention.

That quinine is the sovereign remedy for malaria is more generally known now than it was before the War. It has other uses which increasingly add to the demand, already such as make it possible to speak of a world shortage. For various reasons which need not be discussed here the Dutch have the command of the trade in the bark, which as one writer said had done for medicine what gunpowder did for war.

I wish to express my obligation to several of the speakers at the Wellcome Historical Museum Celebration, who treated at length some of the aspects of *Cinchona* history touched on in this article.

MOSQUITOES BREEDING IN PLANT PITCHERS.

By F. W. Edwards, M.A., Assistant Keeper, Department of Entomology.

Among all the modifications in form and function undergone by the leaves of plants, few are more remarkable than the water-holding "pitchers," which are found in two distinct families of plants: the Sarraceniaceæ in America and the Nepenthaceæ in the tropics of the Oriental region. In the former the pitcher is formed by the whole leaf, in the latter by the blade only, the base of the stalk being changed into a blade-like structure, the outer portion so supporting the pitcher that it can be held erect. In both cases the function of the pitcher is the same, to act as a trap for insects. To this end the pitchers are often brightly coloured, a very attractive honey-like secretion is produced around the rim, and a special lid (closed in the young pitcher, but always open later) may serve as an alighting-place for insects. The pitchers contain a liquid which, though consisting largely of rain-water, is partly produced by special glandular cells in the pitcher itself. Several analyses of the liquid have been made, and it has been proved to contain digestive enzymes which can dissolve the soft parts of the insects which fall into the pitchers and are drowned, thus providing the plants with an important source of food. Great numbers of ants and other insects are so trapped, and not infrequently larger creatures such as scorpions and centipedes, or even small mammals or birds, may also fall victims to these plants.

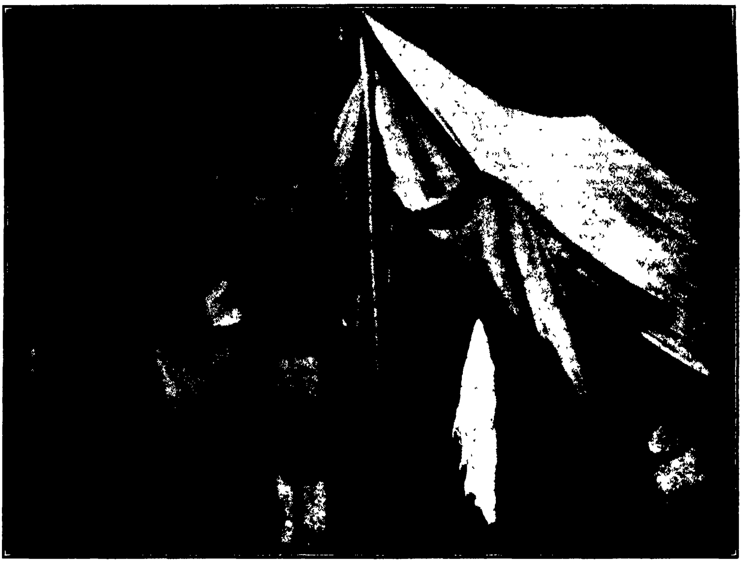

FIG. 1.—CAMP ON MOUNT KINABALU.
Mr. F. N. Chasen holding pitcher of *Nepenthes rajah.*

It is a common occurrence in nature for the structures developed by one species for its own special needs to be discovered and utilized by other species. Pitcher plants provide a case in point; in them spiders, mites, moths, and a variety of flies find food, or shelter, or both. The larvæ of flies live in the liquid and find abundant food in the drowned or drowning insects, or in the protozoa and bacteria which are also there. All such larvæ have to develop the power of resistance to the digestive action of the fluid, and it is therefore not surprising to find that most, though not all, of the species breeding in the pitchers are more or less restricted to this habitat. An interesting summary of the subject, giving an account of experiments on the chemistry of the liquid and the resistant properties of the larvæ, has recently been published by Mr. C. Dover.*

The discovery that some mosquitoes breed in plant pitchers was first made in 1900 in North America by J. T. Brakeley, who found the small *Wyeomyia smithi* in the pitchers of *Sarracenia purpurea*, the life-history of this species being worked out in the following year by J. B. Smith. The eggs of this insect are laid in the young, dry pitchers, and when liquid later accumulates the larvæ hatch; they live through the winter and develop into perfect insects in the following spring. *Sarracenia purpurea* has a wide range in eastern North America, and wherever it occurs *W. smithi* is found with it. In these latitudes the winters are severe and the water in the pitchers is frozen solid for several months on end; it is a remarkable fact, confirmed by several observers, that the mosquito larvæ are capable of surviving this period of cold storage unharmed. *W. smithi* is easily reared in captivity, and it may be of interest to note that specimens were successfully reared in the British Museum (Natural History) from larvæ collected by Major Grant-Suttie in Newfoundland in 1928.

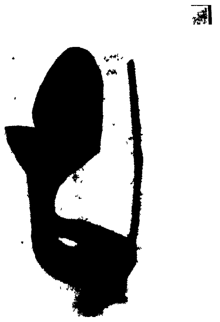

FIG. 2.
PITCHER OF *Nepenthes lowii* (one-sixth natural size).

In the East the first discoveries were made by Dr. G. F. Leicester in the Malay Peninsula, and Mr. C. S. Banks in the Philippine Islands, who reported finding mosquitoes breeding in pitcher-plants in 1908 and 1909 respectively. Since then several investigators have paid attention to the subject, and we have a rather lengthy list of species of mosquitoes known to breed in *Nepenthes* pitchers. In the course of his studies at Singapore, Surgeon-Commander D. H. C. Given, R.N., found the larvæ of no fewer than sixteen species of mosquitoes in the pitchers of the three *Nepenthes* occurring in that locality. The *Nepenthes* mosquitoes belong to various genera, but several of them have come to resemble one another superficially through the shortening of the breathing tube; from Commander Given's observations it would seem that this organ acts as a foot when the larva is crawling among the thick mass of decaying insects. Under such conditions the ordinary long breathing-tube would doubtless prove inconvenient, and the short tube is probably an adaptation to life in a confined space.

* *Journal of Malayan Branch, Royal Asiatic Society*, 1928, vol. 6, pt. iii, pp. 1–8.

On an expedition to North Borneo in 1929 in company with Mr. F. N. Chasen, Mr. H. M. Pendlebury, of the Kuala Lumpur Museum, collected a number of mosquito larvæ in pitcher-plants, and has kindly supplied the two photographs reproduced here. Mt. Kinabalu is regarded by botanists as the centre of origin of the genus *Nepenthes*, and several species found there—among them the two pitchers illustrated—occur nowhere else in the world. *N. lowii* is common at about 7000 feet; its pitchers (Fig. 2) are about six inches long, constricted in the middle, light olive-green in colour, with splashes of crimson just inside the mouth. In them were found numerous larvæ of the mosquito *Rachionotomyia vicina*, Edw., as well as numerous " rat-tailed maggots " (larvæ of drone-flies). It had been expected that the endemic species of *Nepenthes* on Mt. Kinabalu would be found to harbour endemic species of mosquitoes, but this was not the case; *R. vicina* has also been found by Strickland in the Malay Peninsula, and by Jacobson in Sumatra, breeding in other species of *Nepenthes*. At a somewhat lower level on Mt. Kinabalu occurs the giant *Nepenthes rajah*, in which Mr. Pendlebury also met with many larvæ. As shown in the photograph (Fig. 1), these pitchers are larger and more open-topped than *N. lowii*, and are capable of holding a considerable volume of water; the specimen collected contained about a quart. In this instance the liquid was probably nearly pure rain-water, and therefore less toxic to insect life than the fluid in the smaller pitchers. The adults reared from these larvæ were *Culex shebbearei*, Barraud, a species which had been found on one previous occasion only, when Barraud obtained larvæ in the water in a hollow tree in the eastern Himalayas.

It may occur to readers that if pitcher-plants act as reservoirs of mosquito life they are a potential source of danger to man. Fortunately, however, all the mosquito species found in these places appear to be innocuous, and therefore there is no reason to wage a war of extermination against these interesting plants.

NEW SPIRIT BUILDING EXTENSION.

For many years past the congestion in the Department of Entomology has been acute. Some relief was provided by the installation of galleries or mezzanine floors in certain of the rooms, which admitted of an increase in the accommodation for cabinets, but such measures supplied no additional space for the use of the staff and others wishing to consult the collections. The Empire

Marketing Board early in its history recognized that the successful development of the resources of the British Empire was in no small degree dependent on the achievement of success in combating the noxious insects which injuriously affect the health of man or his cattle, or attack his commodities or the raw materials from which they are derived, and it devoted a considerable sum of money towards the furtherance of entomological research.

THE NEW SPIRIT BUILDING EXTENSION.

Before, however, measures can be devised to counter the depredations of an insect pest its identification is the first and essential step. The Board therefore realized that the work being inaugurated would be seriously hampered unless the collection of insects in the Museum were adequately housed and properly arranged for study, and after consultation with the Trustees of the British Museum it decided to make a grant for the erection of a building for the expansion of the Department.

The best site for the proposed building called for some discussion, as there was no early prospect of the erection of the western extension of the Museum building in immediate proximity to the existing studies and workrooms of the Department. The architects of His Majesty's Office of Works suggested as the most practicable scheme the erection of part of the west wing of the new building that had been provided a few years before for certain of the collections which are preserved in spirit. This proposal received the approval of the Trustees and the Empire Marketing Board, the latter imposing the condition that the Department of Entomology should not be moved from there until at least equivalent accommodation could be found for it in some other part of the Museum.

The part of the west wing of the New Spirit Building which was built is slightly more than half of it as planned; the complete wing will contain an odd number of sections, and equal division would have been inconvenient in construction. Some important modifications were introduced to adapt the building to the use of the Department of Entomology. What will ultimately be the blank walls of fireproof storerooms have been pierced with windows, and the walls separating them from the corridors have been omitted. Each floor thus takes the form of one large room, out of which opens a series of four studies on the north side. A pair of double doors gives access to the large room from the corridor. An interesting feature of the building is the series of three insectaries and laboratory adjoining them, which is on the roof. Provision is made for maintaining the insectaries at different temperatures and degrees of humidity, ranging downwards from what corresponds to a tropical climate; an automatic refrigerator on the floor below enables experiments to be made as to the effect of extreme cold in certain stages of insect life. Unpretentious as the exterior of the building is—the reason being that ultimately it will be concealed from the road by other buildings—it is well lit and equipped, and is admirably suited to its purpose.

On December 5, 1930, the Extension was formally opened.

The Archbishop of Canterbury, as Principal Trustee and Chairman of the Board of Trustees, presided. The Empire Marketing Board was represented by the Rt. Hon. W. G. A. Ormsby-Gore, M.P., and the Commissioners of His Majesty's Works, to whom the building was conveyed for the use of the Museum, were represented by their Secretary, Sir Lionel Earle, K.C.B., K.C.V.O., C.M.G.

The Director, Dr. C. Tate Regan, F.R.S., in opening the proceedings, said: "The Museum of Natural History and the British Museum at Bloomsbury are in future to be independent of each other, but both will be governed by the same Trustees. At South Kensington we hope that the connection with the British Museum, through the Trustees, may endure; to us it signifies the retention of certain ideals and certain traditions of scholarship and of the pursuit of knowledge for its own sake. There are circumstances that make it difficult for us to live up to these traditions; our work is not only of cultural importance, but of great practical importance. That fact brings with it the danger that our real aims may be misunderstood, that it may be forgotten that knowledge must be gained before it can be applied, and that some people may judge us merely by our part in certain economic investigations. Our main business is to form collections of all natural objects, whether animal, vegetable, or mineral, and to have these collections complete, accurately named, arranged according to a natural system, and available for study. By means of such collections things can be correctly named, and the correct name of an animal or a plant, a fossil or a rock, is the key to all that is known about it. Arrangement according to a natural system, which involves much research, also has a practical value. For example, nothing may be known of the life history and habits of an insect sent for identification, but a good deal may be known about those of the group to which it belongs. Our collections are put in order for other people to use, and they are so used: but, in addition, the staff are expected to make identifications and to give information and advice, and these things occupy a good deal of our time. Of all groups of animals, insects are of the most importance in relation to human affairs. There are known to science about half a million different kinds; some are friends of man, but many of them are his enemies, ravaging his crops, destroying his stored products, and acting as carriers of disease. Consequently, it is the Department of Entomology more than any other that has to make identifications, to answer inquiries, and to find room for and to help the numerous people who want to work on the collections. The collection of insects numbers about six million specimens, and we have had great difficulty in housing it and in finding quarters for the staff and other workers. For many years the Department has been asking for more room and more staff; now it is to have the staff, and it has got the room." The Empire Marketing Board, continued Dr. Regan, took no narrow view of its duties. It had realized the importance to the Empire of the work of the Department of Entomology and the intimate relation of that work to health, to agriculture, and to commerce. It had also realized how the work had been hampered by want of space, and it had generously provided the money for the erection of that building.

Mr. Ormsby-Gore said that there were vast stretches of territory where man was still competing with the insect for mastery. Almost half the battle of Africa was the battle of man against the tsetse fly, and man had not yet won. In dealing with the problem of Imperial development it was impossible to make headway without the aid of modern science. One of the tragedies had been the shortage of a properly trained scientific staff. They depended upon entomology in dealing with tropical disease. The Empire Marketing Board had given £200,000 for different forms of entomological research, and he hoped the day would never come when the British Government would cut down the all-important research activities carried out under the auspices of the State.

Sir Lionel Earle said that that famous Museum was far from having reached its maximum development; there was space for expansion on the north and on the east and west. It had reached a stage when building developments were essential for the proper carrying out of its functions.

The Archbishop of Canterbury expressed the thanks of the Trustees of the Museum to the Empire Marketing Board and the Office of Works for their help, the value of which it was difficult to exaggerate. The extension of the Entomological Department had long been necessary. They all appreciated the association between the Museum and the Government in the development of the Empire and its resources. He hoped the words of Mr. Ormsby-Gore would quicken a desire in them to see that through their schools and universities there came a succession of fit persons qualified to serve the Empire by scientific research in the regions of biology, and, indeed, in every branch of science.

BOOK NOTICE.

Bulletin of the Biogeographical Society of Japan, Vol. I, No. 3. June, 1930.

In the summer of 1929 the Hon. Masauji Hachisuka, Mr. Momiyama, and Dr. Yaichiro Okada made a trip of eleven days to the Bonin Islands with the object of investigating the fauna and flora of these islands, and the present number of the journal is devoted to reporting on their collection.

Most of the papers are in Japanese, but some of the tables of distribution, the scientific names and synonomy are in English, and one paper on insects is in German.

Mr. Hachisuka gives a readable account in English of the trip, and explains that the different reports do not merely deal with the specimens collected, but have been made as complete as possible from the writings of previous investigators.

There are reports on the mammals, birds, land and fresh water mollusca, insects, plants, and a description of a new lizard—this last by Dr. Okada in English.

The Bonin Islands are of special interest to us since Captain Beechy visited them in "H.M.S. Blossom" in 1827 and with the assistance of G. Tradescent Lay, the naturalist, and A. Collie, the surgeon, brought back a number of zoological, botanical and geological specimens.

These collections were handed over to the British Museum, the Museums of the Zoological Society, the Naval Hospital, Haslar, and the Geological Society of London, and subsequently many of the specimens found their way to the National Collection.

There are several coloured plates, including one of the Extinct Grosbeak *Chaunoproctus ferreirostris* (Vigors) drawn from the two specimens in the British Museum.

Natural History Magazine

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THE INDIAN MUSEUM, CALCUTTA.

By B. PRASHAD, D.Sc., Superintendent, Zoological Survey of India.

THE Indian Museum of Calcutta is the premier and probably the oldest institution of its kind in the whole of Asia, and it has been suggested to me that a short account of the history and development of this institution will be of interest for the readers of the *Natural History Magazine.* The Indian Museum, to put it briefly, is the national repository of collections of Indian antiquities, of the natural history of the country and in fact of most parts of Asia, of the economic products and the arts and crafts of India. In addition it houses probably the finest collection of Indian pictures of the various Hindu and Mohammedan Schools as well as representative paintings of modern Indian art. It will thus be seen that the Indian Museum of Calcutta corresponds not only to the British Museum before its Natural History sections were transferred from Bloomsbury to their present quarters in South Kensington, but also includes within its domains the National Picture Gallery of the country as well.

FIG. 1.—INDIAN MUSEUM, CALCUTTA.
As seen from the Maidan.

To appreciate properly the history of this Museum, which, though a Government institution, is, like the British Museum, controlled and managed by a separate Board of Trustees, we have to go back to the last quarter of the eighteenth century, when, with the establishment of British rule in India, the well-known Asiatic Society of Bengal was founded in Calcutta in 1784 by the famous Oriental scholar, Sir William Jones. In enunciating the policy of the Society, Sir William Jones, with his characteristic foresight, laid down that "the bounds of its investigations would be the geographical limits of Asia, and that within these limits its inquiries would be extended to whatever is performed by Man or produced by Nature." In connexion with the work of the Society he did not expressly lay down the foundation of a museum as one of its activities, but curiosities of all kinds, which were sent to the Society from time to time by its members from all over the country, made it incumbent on the Council of the Society, in the absence of any other institution in the country, to start and maintain a museum of its own. It was not till 1814, however, that the Museum could be started. Meanwhile the Council of the Society had been carefully considering the scope of the Museum, and this they very wisely defined in the widest possible terms: "as an institution for the reception of all articles that might be sent to illustrate Oriental manners or history, or to elucidate the peculiarities of Art or Nature in the East."

This Museum of the Asiatic Society continued to flourish till, owing to the failure of its bankers, Palmer & Co., the Society found it absolutely impossible to bear the heavy cost of running a museum, and in 1836 it memorialized the Government of India for financial assistance. In this memorial the Council of the Society set forth the "absolute necessity for the foundation and superintendence of the Museum, quite as much for the furtherance of Science as for the instruction of the Indian fellow-subjects of the memorialists, of a public repository of the products of Nature in India and the surrounding countries, properly preserved, properly arranged, and properly applied." The Governor-General and his Council in Calcutta expressed their inability to make any grant without reference to the Court of Directors of the East India Company in London, as it was pointed out that the upkeep of a museum and library at the India House in London was costing the Government a great deal of money. They, however, agreed that under the existing conditions no museum in India could be maintained in a proper condition by voluntary subscriptions alone, and that liberal aid must be provided from the public funds in the same way as was being done in the case of similar institutions in Europe. A detailed account of the various appeals made by the Society and the discussions that resulted between the representatives of the Government on the one hand and those of the Society on the other, cannot be given in this short article, but it may be noted that in 1839 the Society succeeded in obtaining a grant of 300 rupees (about £20) a month for its Museum. In 1840 the Government of India, encouraged by the satisfactory working of the coal mines at Raneegung in Bengal, decided to establish a Museum of Economic Geology in Calcutta, and till 1856 this Museum was also located with that of the Society in the Asiatic Society's rooms. Soon after the establishment of the Geological Survey of India it was decided to remove the Museum of Economic Geology into a separate building, and the Government of India at this stage offered to receive the geological collections of the Society's Museum in the new building. The Society, while fully realising that its collections would be better preserved, better laid out, and better taken care of by the officers of the Geological Survey, refused to agree to this proposal on the ground that the dissociation of a part of its Museum "might possibly postpone indefinitely the great object which the Society had cherished since 1837, namely, that of seeing a National Museum" established in Calcutta on a scale worthy of the Indian Empire. In 1856 the Society, realizing that the further growth of its Museum was impossible, because of not only the limited funds at the disposal of the Society, but also the restricted space in its rooms, petitioned the Government of India for the establishment of an Imperial Museum in Calcutta and offered to hand over all its extensive collections except the library as the nucleus of such an institution. The consideration of the proposal was postponed by the Mutiny, and even on a subsequent occasion the Government declined to entertain the proposal on financial grounds. The Society, however, persisted in its appeals, and in 1862 succeeded in inducing the Government of India to agree to its proposals. The Indian Museum Act was passed in 1866, and the Museum of the Asiatic Society, popularly known as the Jadu Ghar (the House of Mysteries) was transferred to the newly-erected building on the main thoroughfare of Calcutta, the Chowringhee, in 1875. The new Museum at its inception consisted of three sections—the Zoological, the Archæological, and the Geological—the Museum of Economic Geology being amalgamated with it from the very beginning. In 1887 the Economic and Art Section, which had developed as a separate institution under the direct control of the Government of Bengal, was also amalgamated with the Indian Museum.

Various schemes of reorganization have taken effect since that date, and the Indian Museum at present consists of the following sections :—(1) Zoological and Anthropological (Anthropology is given a very wide scope, as it includes within its domain Physical and Cultural Anthropology and Ethnology); (2) Geological and Palæontological; (3) Archæological; (4) Economic Section, including the Botanical department; and (5) the Art Section. The general management of the Indian Museum is vested in the Trustees and is carried out by the Honorary Secretary with the help of a Committee of Management constituted by the Heads of the various Sections of the Museum. There is no separate Director of the whole Museum, and the different sections are managed respectively by the Director of the Zoological Survey of India, the Director of the Geological Survey of India, the Superintendent of the Archæological Section (an officer of the Archæological Survey of India), the Officer in charge of the Economic Section (an officer of the Botanical Survey of India), and the Principal of the Government School of Art, Calcutta.

The main Museum building, as already mentioned, was occupied in 1875, although it was not finally completed till 1877. It is a quadrangular building in Greek style, and is built of red bricks overlaid with a sandy-grey plaster. The western wing with the main entrance extends for over 500 feet along the Chowringhee, and faces the Maidan (the famous green park of Calcutta), which extends from the Chowringhee to the River Hooghly, and on which is also built the Fort William of Calcutta. The Indian Museum, as will be seen in the photographs reproduced, is a very imposing building, of great simplicity and charm, and occupies one of the most central and conspicuous sites in the City of Palaces, as Calcutta is often styled. The four sides of this quadrangular building consist of public galleries on two floors, and on each floor there is a broad passage, enclosed by a colonnade in the Italian style and overlooking an open, turfed, rectangular plot in the centre. In addition to this main quadrangle there is the three-storied new wing built in continuation of the western part on its south side, which now houses the public galleries of pre-historic Archæology and Art on its ground and first floors respectively. There is similarly a block on the north-east side of the quadrangle for the Ethnological and Industrial galleries and the Herbarium; this is to be seen in the background on the right in the second photograph. Both these wings were built long after the main building and are not quite in harmony with its style, but, as the result of the care

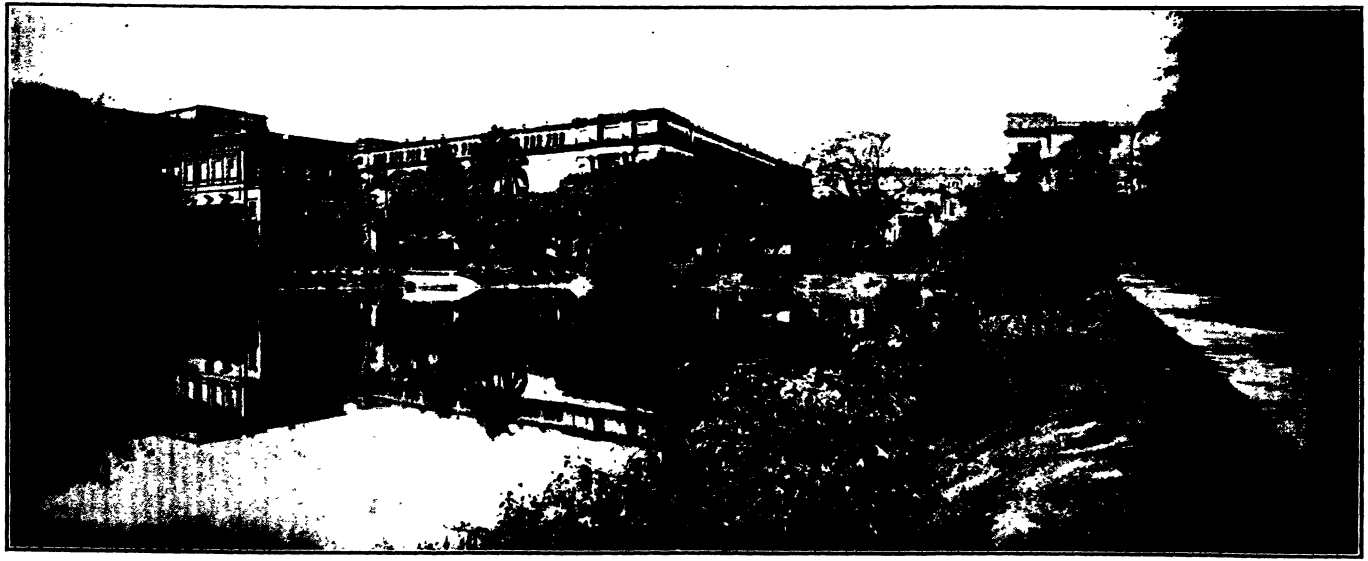


FIG. 2.—INDIAN MUSEUM, CALCUTTA.
Back view.

exercised by the architects planning them, they do not in any way detract from the majestic simplicity of the main quadrangle. The offices and reserve collections of the Geological Survey of India are in a separate building, which is situated in the same compound to the east of the main Museum, and those of the Zoological Survey of India are housed on the top floor and in some of the galleries on the first floor of the main building on its Chowringhee face.

The Indian Museum, with its very rich and ever-growing collections and the important research work carried out in its different Sections, has played an influential part in the cultural advance of the country. Started originally as the private museum of a Society, it has grown into an Imperial institution of vast proportions, and is at present the headquarters of several scientific surveys of the country. Like similar institutions in other countries, it is at the present moment congested and urgently needs more buildings for its expansion.

A PECULIAR BEETLE LARVA.

By K. G. Blair, B.Sc., Assistant Keeper, Department of Entomology.

The caterpillars of the Butterflies and Moths, many of them large and handsome creatures presenting many beautiful examples of mimicry, protective coloration and kindred biological phenomena, have been the objects of observation and study since the very early days of entomology; yet as regards the tropical species comparatively few even of these are known and identified with the butterflies or moths to which they give rise. When, however, we come to the other orders of insects our ignorance of their early stages is truly abysmal. In these circumstances it is not surprising that on receiving a beetle larva (for example) we can seldom assign it with certainty to any definite species; sometimes we can name its genus, in most cases say that it belongs to such and such a family, but from time to time a larva turns up for which we are at a loss to do even this. The subject of the present note is a case in point.

Some twenty-five years ago Mr. H. S. Barber described and figured a remarkable beetle larva from California which, though showing Malacoderm affinities, he was unable to place in any particular family. Since then larvæ of the same kind have been found on various occasions and under somewhat different conditions, but never in association with the perfect beetle, and all attempts to rear them have failed. In outline the body is oval, flattened, fringed with a series of frond-like processes and furnished with a stiff spike-like tail. The skin is rather leathery, studded with numerous small hard granules, and clothed with very peculiar hair-structures in the form of hollow cones attached by their points, resembling the membranous calyx of the fruits of the Thrift (*Armeria*) (Fig. 1).

This larva was first found under the bark of a dead tree-yucca, subsequently under dead bark or dead leaves, and also in cracks and hollows in the vertical faces of ledges of rock. In the latter case abundant remains of hibernating insects were noted, and these no doubt would also be present under dead bark. The jaws of the larva are sharp, curved and hollow, evidently of a predaceous type not unlike those of the Glow-worm larva, to which it was considered to be probably allied. But the larva is perhaps the most slow-moving insect known; it will remain stationary for days together, and when it does move its rate of progression can be compared only with that of the minute hand of a watch. That so lethargic a creature could ever capture living prey seemed quite impossible, yet it had been observed on one occasion with a small Hymenopteron, on another with a spider, held aloft in its jaws. On account of its suggested affinity with the Glow-worm it was given chopped snail, but though it seemed to relish the moisture it is doubtful whether it really fed. Larvæ have been kept alive without feeding and without moulting for long periods, even up to over two years, so that they are well able to sustain long fasts. It has also been thought that spiders' or snails' eggs might prove an appropriate food for such an inactive creature, but it seems probable that the solution of the mystery of its food is to be sought in the hibernating insects found with it, and that it is upon such comatose yet living insects that it preys. The recorded cases of the capture of the Hymenopteron and spider would not contradict such a supposition, and the larva's evident ability to withstand long fasts, such as it would have to undergo if it could obtain its food only during the winter months, suggests that such fasts form a normal feature of its life history.

Photo: H. Main.

FIG. 1.—LIVING LARVA OF *Brachypsectra fulva*, LEC., ON PINE BARK. × 2.

More recently Prof. G. F. Ferris, to whom and to Mr. E. E. Green the Museum is indebted for living (but since dead) and mounted specimens of this interesting larva, published a new figure of the larva in the hope of eliciting information that would lead to the discovery of the identity of the beetle. This figure was recognized by Mr. Ramachandra Rao as resembling some larvæ found by him under the bark of tamarind trees at Coimbatore, S. India. A certain scepticism as to the real affinity of two such forms, one from California and Texas, the other from S. India, was perhaps pardonable, but on specimens of the larva and of the beetle reared from it being submitted it was found that Mr. Rao was unquestionably right; the Indian larva, though presenting certain slight differences from the American, was undoubtedly of the same genus (Fig. 2).

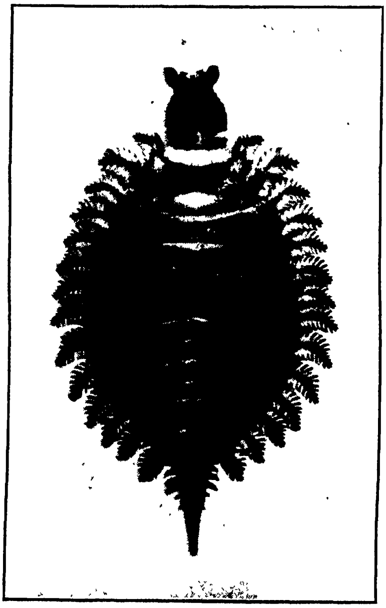


Photo: E. E. Green.

FIG. 2.—LARVA OF *Brachypsectra lampyroides*, BLAIR.

However, the beetle (Fig. 3) was not represented in the National Collection, but was considered to belong to the family Elateridæ, the Skipjacks, and was sent to Monsieur E. Fleutiaux, the French authority on this family, for his opinion. By him it was recognized as belonging to the genus *Brachypsectra*, Leconte, of which only one species, a rare insect found in Texas, was known to science. M. Fleutiaux most kindly sent his only specimen to the writer for purposes of comparison. Thus by a pretty little piece of international co-operation the riddle of the identity of this particular unknown larva was solved.

Though the question of the identity of this larva is thus set at rest it yet remains a subject of much mystery, particularly in regard to its true affinities, its geographical distribution and its mode of nourishment. The latter point can be cleared up only by further observation.

As regards its systematic affinities, it is noteworthy that Leconte placed the genus in a subfamily by itself in the Dascillidæ, a family in many respects closely allied to the Elateridæ, and in this opinion he is supported by M. Fleutiaux. In the characters afforded by the perfect beetle and in those of the larva the genus differs considerably both from normal Dascillidæ and from

Elateridæ, but no doubt occupies a position somewhat intermediate between these two large families. The degree of its approach to the one or the other is of little consequence, but what is important is its extreme isolation in a subfamily, if not a family, all by itself. In its structural features the beetle is of a somewhat primitive type, but the larva, on the other hand, is highly specialized. The tough leathery skin, further protected by the hard embossed granules, and the surrounding fringe fitting closely against the surface upon which the larva is resting are probably both means of protection against the attacks of ants, but no larva at all approaching it is known in either Dascillidæ or Elateridæ. In other families, it is true, we have something very similar; thus in the Museum Collection is the larva of an undetermined species of the widely different family Endomychidæ (probably *Eumorphus* sp.) of similar general shape, and with a surrounding fringe of frond-like processes exceedingly like those of *Brachypsectra*. Again, in the Ascalaphidæ (Fig. 4), a family of the Neuroptera (*sens. lat.*), we find larvæ of similar shape and with a somewhat similar surrounding fringe, but in this case the processes themselves are simple but fringed with long setæ. In both these instances the protecting fringe has been independently evolved, in the one case on the same lines, in the other on somewhat different lines, yet both with the same object of protection against the attacks of ants.

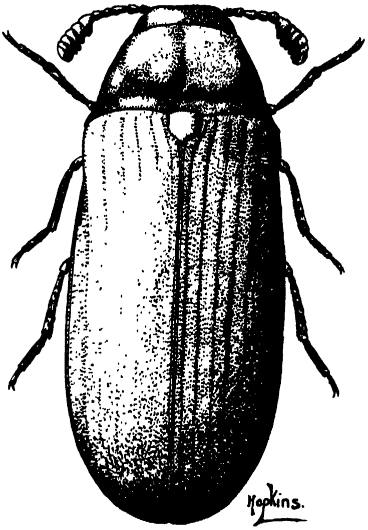


FIG. 3.—*Brachypsectra lampyroides*, BLAIR.

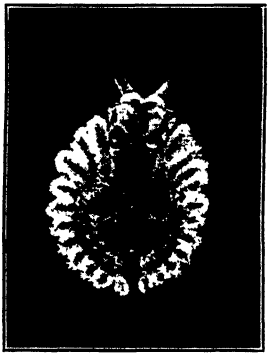


Photo: H. Main.

FIG. 4.—ASCALAPHID LARVA FROM EAST AFRICA.

In the case of *Brachypsectra*, however, the similarity of the Californian larva to the Indian larva must be due to community of origin. The question is, has one species remained in or near its original centre of dispersion or have both wandered from the common ancestral territory ? In the latter case, which seems much the more likely, it is probable that this original centre of dispersion was in the neighbourhood of Northern China, the Indian species having wandered southwards, the other northwards *via* the Behring bridge to its present home. That these two species represent all that is left of such a dispersal is somewhat improbable, in fact a specimen of a third, from Singapore, is contained in the Museum Collections, and it is only to be expected that further species will be discovered, perhaps in China, Japan, or British Columbia.

RECORD COW ELEPHANT TUSKS FROM UGANDA.

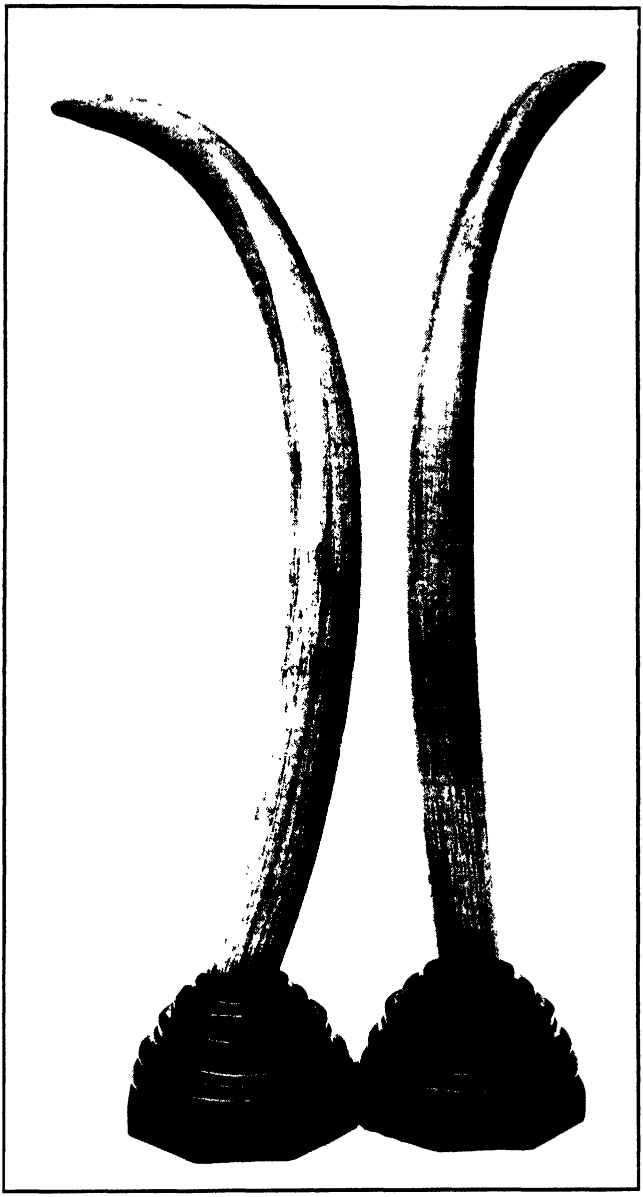
By J. G. Dollman, B.A., Assistant Keeper, Department of Zoology.

The Museum has recently received on loan a pair of cow elephant tusks, which constitute a record for the African species. These tusks belonged to an elephant shot by the late Mr. P. C. Pearson, a Game Ranger in Uganda, and were presented by his relatives to His Excellency Sir William Gowers, K.C.M.G., the Governor of Uganda, who has lent the specimens for exhibition in the Museum.

The tusks are an exceptionally fine pair and might easily be taken for those of a bull elephant. They measure 6 feet 7 inches and 6 feet 3½ inches in length and weigh 52 lb. and 46 lb. respectively. In South Africa cow elephants, when full-grown, rarely carry tusks weighing more than 10 to 14 lb., and tusks of 20 lb. and over were reported by Selous to be very rare, although he records having weighed one which turned the scale at 39 lb. In East Africa female ivory, as a rule averages only from 12 to 24 lb. per tusk, but an exceptionally large pair have been recorded by Mr. A. H. Neumann which weighed about 36 lb. per tusk. From these figures it is evident that the tusks procured by the late Mr. P. C. Pearson are of very unusual size for a female elephant.

Male ivory is, of course, of very much greater dimensions and weight; the longest tusks on record being two in the American National Collection which measure 11 feet 5½ inches and 11 feet respectively and weigh 293 lb. the pair. The heaviest tusk on record is one in the Museum Collection which weighs 226½ lb. and measures 10 feet 2½ inches in length with a circumference of 24¼ inches; both these large bulls were shot in Kenya Colony. Another large bull elephant came from Mongalla in the Sudan, in which the tusks measure 10 feet 4 inches and 9 feet 7 inches in length and weigh 120 lb. and

123½ lb. respectively; this specimen was owned by the late Duc de Montpensier. These bulls, however, carried ivory of very exceptional size; normally, good African ivory



Record Pair of Cow Elephant Tusks from Uganda.
Length 6 ft. 7 ins. and 6 ft. 3½ ins.

will measure from 8 to 10 feet in length and weigh from 100 to 180 lb.

Indian elephants carry much smaller tusks, rarely exceeding 7 feet in length or weighing more than 100 lb., although an exceptionally fine pair is owned by His Majesty the King, measuring 8 feet 9 inches and 8 feet 6½ inches in length and weighing 161 and 160 lb. respectively. The females of the Indian elephant, as a rule, have only very small tusks which do not project out beyond the jaws.

It is proposed to exhibit these Uganda tusks in a case in the East Corridor adjacent to the very fine pair of bull elephant tusks from Kenya Colony presented by His Excellency the Governor of Kenya Colony in 1927; these latter tusks measure 9 feet 2¾ inches and 9 feet 2½ inches in length and weigh 168 lb. and 166 lb. respectively.

PSEUDO-METEORITES.

By L. J. Spencer, M.A., Sc.D., F.R.S., Keeper, Department of Mineralogy.

Since the year 1795, when meteorites were first seriously considered to be a reality, only fifteen authenticated falls of such bodies from the sky have been recorded in the British Isles (seven in England, three in Scotland, and five in Ireland). All these, with the exception of one iron, are stony meteorites. All are represented in the British Museum, the main mass of seven of them being preserved in the Collection, including 45½ lb. of the historic stone which was seen to fall at Wold Cottage near Scarborough on December 13, 1795, and originally weighed 56 lb. The main masses of four of the stones have unfortunately been lost, through being allowed to remain in private hands. The Launton (Oxfordshire) stone, seen to fall on February 15, 1830, was also very nearly lost in a private collection, but fortunately it was identified many years later with the help of an original cast preserved in the Museum Collection—but this is another story.

In strong contrast with this rarity of genuine meteorites is the abundance of pseudo-meteorites. Without any exaggeration, it may be said that thousands of alleged or supposed meteorites have been submitted to the Department for examination, and have, much to the disappointment and at times the annoyance of the owners, been "turned down." Since my encounter with a former Director of the Meteorological Office, who produced a fine clinker from a water-butt after a thunderstorm, I have learnt to humour such persons.

Meteorites are shrouded in mystery and ignorance—we do not know whence, why, or when they come; and it is therefore little surprising that there are so many misunderstandings and errors as well as glamour and superstition concerning them. They arrive suddenly and unexpectedly, and the accompanying phenomena are often so alarming that any privileged observer is too scared and unprepared to observe accurately. There is a vast difference between the arrival of a little-expected meteorite and of a little, expected meteorite. The terms " thunderbolt " and " fireball " are also applied to the equally alarming phenomena caused by lightning. Many supposed meteorite falls are doubtless to be attributed to ball- or globe-lightning, about which very little appears to be known. A person, who had been closely pursued by a ball of lightning, when asked to describe it in detail, naïvely replied, " I did not stop to see." After the disturbance is over one naturally looks round for the thing that has fallen, and any strange or partly fused object may be picked up.

Any report of the fall of a meteorite during a thunderstorm must be received with caution, for there is no connexion between the chance arrival of a meteorite and the electrical condition of the clouds. A " bolt from the blue " is more promising. Shooting stars of small magnitude are burnt up in the atmosphere and dissipated as cosmic dust. Large and brilliant meteors no doubt in most cases fall as meteorites, but their place of fall is often not found, and the chances are that more than two-thirds of them fall into the sea, where they would soon be disintegrated. Fossil meteorites are unknown.

In Sir Lazarus Fletcher's " Introduction to the Study of Meteorites " * twenty-nine pseudo-meteorites represented in the collection are solemnly listed under special names, these having been described in scientific journals as meteorites and later disproved. One of these is mentioned below under the Newstead " meteorite," and a study of the literature relating to the others would no doubt yield some interesting details. Many others have got no farther than the daily newspapers, and still more not even so far. An entertaining book could be written on the subject, but the primary object of the present note is to draw attention to the Hang-chow " meteorite," which has recently been added to the Collection.

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* Eleventh edition, 1914; since replaced by Dr. G. T. Prior's " Guide to the Collection of Meteorites " (1926), and " Catalogue of Meteorites " (1923) with Appendix (1927).

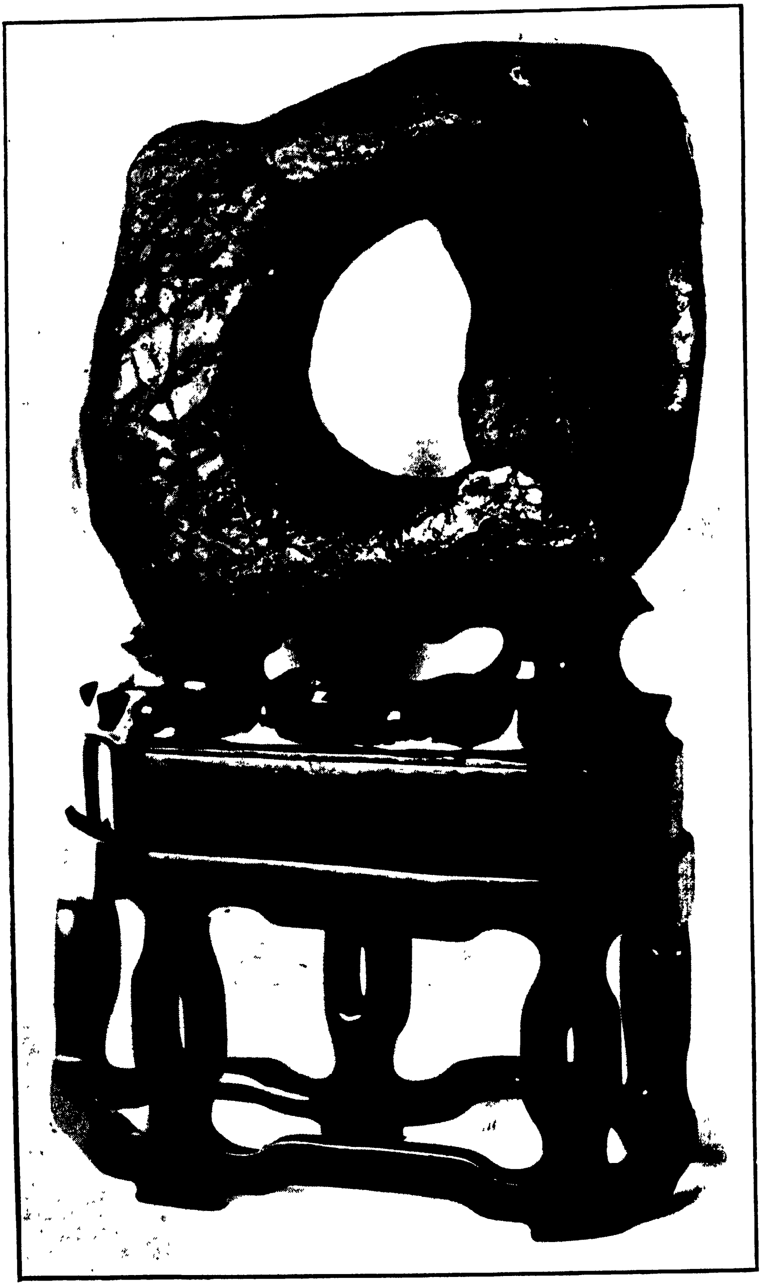


FIG. 1.—THE HANG-CHOW "METEORITE."
A weathered block of limestone. (½ natural size.)

The Hang-chow "Meteorite."

This specimen was generously presented to the Museum in January 1931 by Mr. Edward Heron-Allen, F.R.S., who had acquired it in 1928 from Mr. K. K. Chow, the London representative of the Tonying Art Trading Company. He went to considerable trouble in tracing as far as possible the history of the stone and in getting deciphered the Chinese inscriptions on its surface. The suggestion that it was not a meteorite therefore came to him rather as a thunderbolt; but he was readily convinced when he saw the brisk effervescence caused by a drop of dilute hydrochloric acid. The stone is in fact a block of limestone, showing on its rounded surface the wrinkles so characteristic of limestones that have been weathered by the action of rain-water charged with carbon dioxide. It reminded me at once of the blocks of limestone on the Yorkshire moors.

The odd-shaped perforated block (Figs. 1 and 2) measures $7\frac{1}{2} \times 6\frac{1}{2} \times 4$ inches and consists of a dark-coloured, compact limestone. It is effectively mounted on a carved wooden stand. This is the bald scientific description of the specimen. The following more romantic account, due to Mr. Heron-Allen, he very kindly allows me to incorporate.

Mr. Chow bought the stone about 1920 from a Mr. Liu of Shanghai, who in turn had it from a friend in Hang-chow in the province of Che-kiang. It had been in the latter family for very many years, and Mr. Liu was told that the stone had fallen in Hang-chow hundreds of years ago. In this family it had been a revered possession and an object of worship. The style and engraving of the inscription are ancient, "several hundred years old," and the wooden stand is probably eighteenth-century work.

At one end the stone bears the inscription No. 1 in Fig. 3, one translation of which is:

(1) The Tiger's Mouth opens to the Sun

This describes the shape of the stone and gives it a name, "The Tiger's Mouth." At the other end is engraved a poem, which reads:

(2) The black Tiger roars to the Sun
The dark green Dragon raises the storm-clouds
It is the heavenly purity of the Wonderful Valley
It sounds like the chiming of gold and jade (instruments)

(3) It is surely as rare as the jade of Ho
I regard it as a perfect treasure

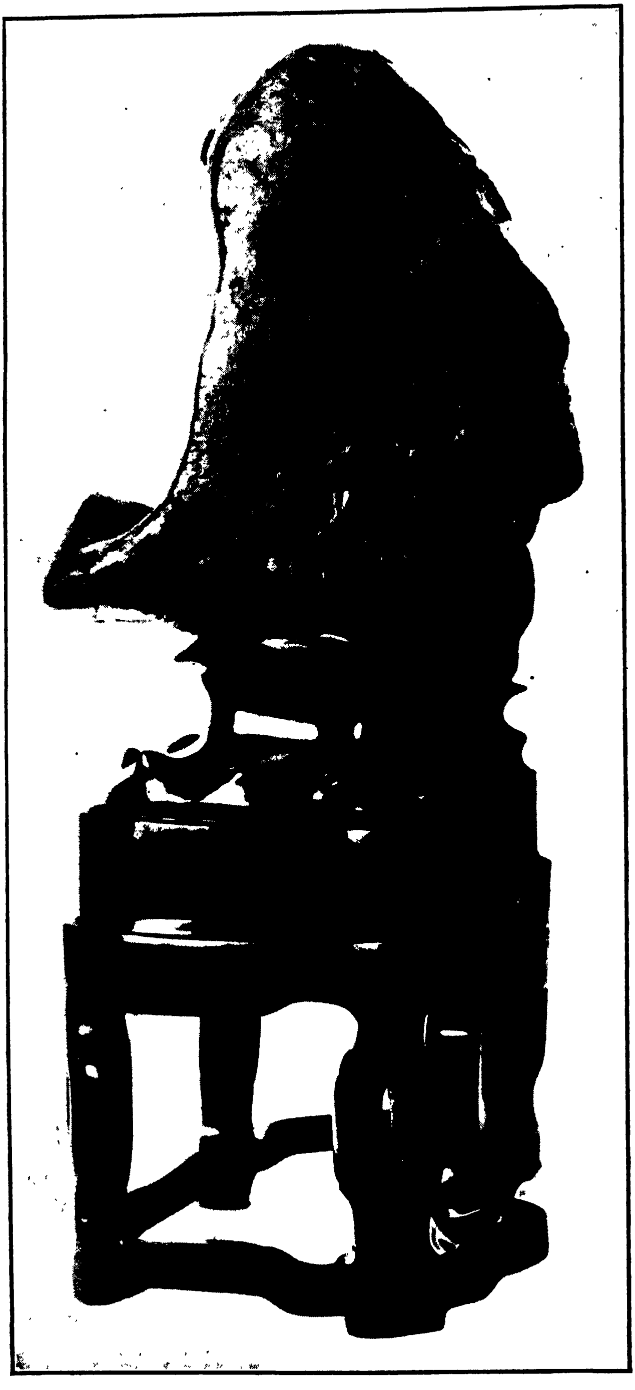


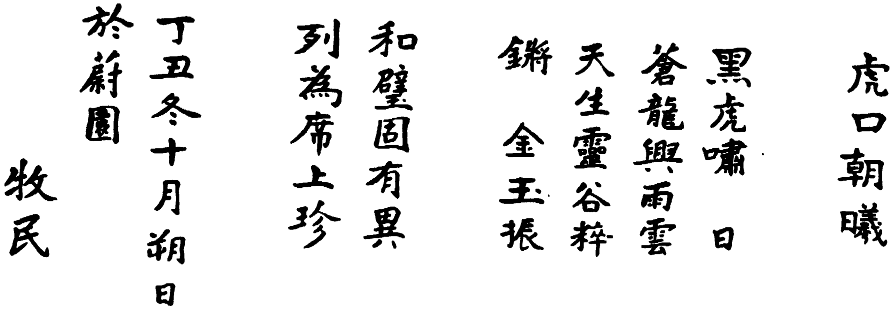
Fig. 2.—The Hang-chow "Meteorite," showing the Chinese Inscription. (½ natural size.)

The last two (three in the copy, Fig. 3) vertical lines read:

(4) (Inscribed) the first day of the tenth month of the year Ting Ch'ou in Wei Yuan (the Luxuriant Garden) by Mu Min (the People's Shepherd)

Inside the " mouth " is engraved a small square " hong " or seal-mark, which reads *Tzŭ-ching*, and is perhaps the name of a former owner of the stone.

The correct interpretation of this Chinese poem is much more difficult than any ordinary poetry. According to one version it relates how the stone (" the black tiger ") was lit up in the sun after a great storm (" the green dragon "), and excited the wonder of the dwellers in the Wonderful Valley. When it was struck it gave forth a musical note. In any case, any hint as to the meteoric origin of the stone appears to be very skilfully concealed. There is even a difference of opinion in the rendering of the first two characters in the first column (to the right in Fig. 3): *hu* (tiger) and *k'ou* (mouth) taken together, *hu-k'ou*, may be the name of a place.



虎口朝曦

(1)

黑虎嘯日
蒼龍興雨雲
天生靈谷粹
鏘金玉振

(2)

和璧固有異
列為席上珍

(3)

丁丑冬十月朔日
於蔚園
牧民

(4)

FIG. 3.—COPY OF INSCRIPTION ON THE HANG-CHOW "METEORITE."

The date of the inscription has been placed at 1757 to synchronize with the style and cutting of the characters and the workmanship of the wooden stand ; but here again there is a difficulty. The year is given as *Ting Ch'ou*, with no indication of the cycle in which it occurs. When recording numerical data in accurate scientific work it is usual to state the limits of error of the observation. The above date would then be given as 1757 ± n60, where n is a whole number. If n is 3, then the date could be either 1577 or 1937 A.D. In order to make this point clearer we must make a diversion into Chinese chronology. To the infidel Occidental " Friday " comes in a cycle of seven days, and " April " in a cycle of twelve months (no doubt a curious arrangement from a Chinese point of view); while to the celestial Chinee *Ting Ch'ou* comes in a cycle of sixty years. Next *Ting Ch'ou* will be celebrated in our year 1937.

In ancient Chinese literature dating from Confucius there are numerous records of stones fallen from the sky or of falling stars turned into stone. P. A. Kesselmeyer in 1860 tabulated 161 of these records covering the period from 1808 B.C. to 1644 A.D., and from these he selected twenty-six of the more certain falls for plotting on his map. It is curious that he gives no records since 1644, and, so far as we know, none of the meteorites has been preserved. Two actual meteorites have, however, recently been recorded and described by officers of the new Geological Survey of China. A stone weighing 87 caties (117 lb.) fell on July 11, 1917, at Nan Yang Pao in Kansu, but only a small fragment could be secured for examination; and a small stone of 82 grams fell on October 5, 1924, near Feng-Hsien in Kiangsu. In his account of the former stone C. Y. Hsieh (*Bull. Geol. Soc. China*, 1923, vol. 2, p. 95) writes, fortunately in English:

> In spite of the immense records of meteoric fall kept in many of the Chinese books, specimens of real meteorite were very seldom found. Perhaps the first found of iron meteorite was from Inner Mongolia described by two Japanese geologists in the *China Mining Journal* of 1921. As to the meteoric stone, so far as the writer knows, nothing has been found. The present contribution therefore will be the first description of a real meteoric stone undoubtfully of the Chinese origin.

In a thickly populated country like China this rarity of known meteorites is surprising, when compared with their relative abundance in India. Since the Benares fall on December 19, 1798, no fewer than 107 meteorites have been recorded from India, the majority of them being stones actually seen to fall. The fine series of Indian meteorites (eighty-one stones, one stony iron, and four irons) in the British Museum Collection is largely due to the help given by the Government of India and the generosity of the Director of the Geological Survey of India, with important contributions also from the Trustees of the Indian Museum of Calcutta and the Asiatic Society of Bengal. From the much smaller land area of Japan eighteen meteorites are known, of which eleven are represented by some exceptional masses in the Museum Collection.

The Newstead "Meteorite."

A mass of iron weighing 32¾ lb. was found in 1827 during the building of a cottage at Newstead on the Tweed in Roxburghshire. The coal-cellar, an original design by the old woman, consisted of a pit sunk four feet in the kitchen floor and covered with a trap-door. The mass of iron was found during the digging of this pit, and it was kept in the garden of the cottage until 1862, when it attracted the attention of Dr. John Alexander Smith, of Edinburgh, while searching for Roman remains. At Newstead, it may be mentioned, there was a Roman fort, and the cottage was built alongside ancient earthworks. Dr. Smith concluded that he had found a meteoric iron, and he published an elaborate description of it, giving a chemical analysis showing 4·86 per cent. of nickel. Half (18¼ lb.) of the sawn block he sold in the same year, 1862, to the British Museum for a substantial sum, and it was exhibited in the Collection as a genuine meteorite until 1897, when a re-examination showed that it contained no nickel and that in all probability the iron was of artificial origin. The specimen, which is now exhibited again as a pseudo-meteorite, shows a curious oval patch, which Dr. Smith in his paper quaintly remarks might by a " careless observer " be mistaken for an inclusion; it is, however, the area on the polished surface that had been etched with acid to show the structure of the iron.

The construction of furnaces for the smelting of iron ores has always been a difficult problem, and even in modern furnaces the best refractory materials become corroded. There is always some leakage of liquid metal below the tapping-hole of the furnace. When old blast-furnaces that have run for a number of years are dismantled, masses of metal are found that have eaten their way into the foundations. Such masses of metal, known as blast-furnace " bears," sometimes weigh as much as 800 tons. Now, if such a mass of metal were found, without any knowledge of the previous history of iron-smelting on the spot, one might hastily conclude that it was a meteorite. It is thus quite possible that the Newstead " meteorite " is such a " bear " from an old iron furnace, perhaps dating back to Roman times. This view is supported by the peculiar hummocky surface of the mass, which is quite unlike the contour of genuine iron meteorites.

The Quetta " Meteorite."

At Quetta in Baluchistan, India, on January 25, 1923, a large stack of hay on the military grass farm was set on fire during a violent thunderstorm. The barracks were struck by lightning, causing some damage, and immediately afterwards there was another flash accompanied by a loud roaring noise. A native watchman, 200 yards from the stack, saw a huge white ball of fire coming from the sky, and he fell down with fright. When he recovered, smoke was rising from the haystack, and a hole 18 inches in diameter was noticed in the side of the stack. The fire burnt out in two days, and amongst the ash was found a quantity of glassy slag, which was believed to represent the " molten meteorite " that had struck the haystack and caused the fire. The slag (" meteorite ") weighed 5 tons 18 cwt. It enclosed pieces of iron wire with which the bales of hay had been bound. The stack contained 12,864 bales of 80 lb. each, giving a total weight of 459 tons of hay.

This " meteorite " clearly represents the ash of the burnt hay which had been fused by the intense heat in the centre of the stack. On an average hay contains about 5 per cent. of ash; and in this case the weight of the slag collected was 1·28 per cent. of the total weight of the stack, showing that only a portion of the ash had been actually fused.

The Takahama " Meteorite."

A paper on a new meteorite by a professor of the Kyoto University was offered for publication in 1924. The subject was introduced as follows:

> According to a legend, a meteorite fell about 400 years ago on an avenue near a town Takahama, province of Wakasa, Japan, and broke branches of some pine trees growing on its both sides. Since any damage to these trees was being strictly prohibited by the Governor, the stone was sentenced to serve as an altar in a cemetery near the town. In fact, it was found there as such till some ten years ago, but it was then transferred to a Buddhist temple not far from the cemetery, whence it was in turn lately further transported to the Kyoto University. This condemnation was rather favourable to the preservation of the stone, so that it keeps amply its original form safe from damages.

The weight of the block was estimated at 870 kilograms. The brief description, together with photographs of the block and of a micro-section, suggested a serpentinized olivine-rock rather than a meteorite. This suggestion was conveyed to the author, with the request for a chip of the material for confirmation, but nothing further has been heard of the matter.

Other Pseudo-meteorites.

A block of crystallized iron slag, consisting of iron silicate (fayalite), was described as having fallen, presumably during a thunderstorm, on August 20, 1898, at Mount Pleasant, Milk River, Jamaica. This was presented to the Museum by Dr. C. A. Matley in 1928. Curiously, however, exactly the same kind of material had been received from Jamaica in 1892, when a considerable amount had been found while digging in alluvium.

This material had perhaps been taken as ballast in a ship returning with a cargo of sugar at some time subsequent to 1673, when sugar was first exported from Jamaica.

Dr. F. A. Rodway, of Nowra, New South Wales, an energetic collector and correspondent of the Museum, sent in 1928 the following particulars of a supposed meteorite.

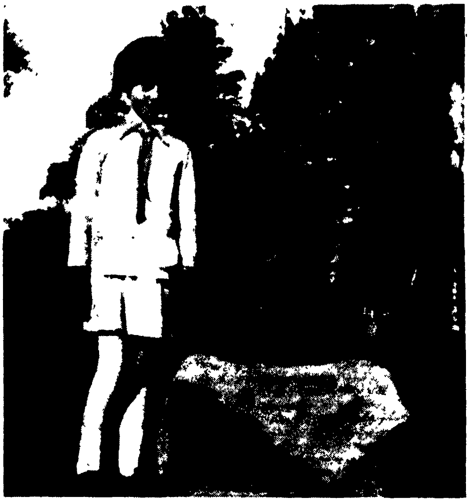


FIG. 4.—"METEORITE" AT NOWRA, NEW SOUTH WALES.
A boulder of basalt.

> An old man who keeps a small "museum" near here has what he says is a meteorite. The history of it is as follows. Two old residents of Brundee, a farming district between Nowra and the sea, four or five miles east of Nowra, saw a meteorite fall in 1889. Mr. Herne tells me that he saw it fall about 9 p.m. during the winter of that year (day and month not remembered). He saw "a bright streak of light with sparks," but heard no sound. The stone was afterwards located in soft soil at the bottom of a crater-like depression four feet deep. All that district is of alluvial soil, and there is no rock in the neighbourhood. Mr. C. Richards (the owner of the museum) went out and brought it home in a cart and has had it ever since. I have examined and photographed it. The weight is about 3 cwt., circumference 42½ to 44½ inches. . . . The evidence seems clear that it is a stony meteorite of exceptionally large size. Mr. Richards prizes it highly, but he might be persuaded to let me chip off a piece for analysis if it is thought advisable.

Dr. Rodway's photograph (Fig. 4) shows a well-rounded stone with none of the pitting and concave surfaces so characteristic of meteorites. He was later able to send chips from the block, and these were identified as basalt with porphyritic crystals of felspar.

Another large block of stone, mounted on the esplanade near the Clarence Pier at Southsea (Portsmouth), was mentioned to me as being perhaps a meteorite. The yarn did not appear very convincing, but I paid a special visit to the spot. I there saw a rounded block of beautifully contorted gneiss, measuring about 4 × 4 × 3 feet and therefore about 1½ tons in weight. Without any inscription this monument had been hastily thought by my informant to be a meteorite; but in the local guide-books there is an interesting account of its origin. During the Crimean War in 1854 raids were made on the enemy store-houses along the shores of the Baltic by H.M.S. "Hecla." At Ekenäs, on the south coast of Finland, the landing party in their retreat made use of this large boulder as a shelter, and brought it back as a trophy. It remained for several years in the Dockyard at Portsmouth. In the Dockyard there still lies another large block of stone with a curious history (but this time duly labelled). H.M.S. "Pique" ran aground off Labrador in 1835, and on her return the block was found firmly wedged in a hole in the hull, thus saving the ship.

The following particulars, together with a doubtful stone, were sent by Mr. D. W. Herdman, Curator of the Cheltenham Museum, on June 20, 1930. The stone proved to be a pebble of sandstone, and clearly had nothing to do with the flash of lightning.

> Mr. H. G. Ellyatt, postman, of Tewksbury Road, Cheltenham, reports that during the first thunder-clap of a storm at 11.30 a.m. on June 18, 1930, while standing at the back door of his house, he was unnerved by a terrific report. At 2 o'clock on the same afternoon his children noticed a round hole in the garden 8 feet from where the father had been standing. The hole was 2 feet deep and 2 feet in diameter, with cracks radiating from the centre. On the following morning Mr. Ellyatt decided to excavate. The earth at the particular spot was composed entirely of sand. On going down to a depth of 8 feet he found a pebble-like stone with no other pebbles near it. . . . During this thunderstorm 3·55 inches of rain fell between 11.30 a.m. and 2 p.m.

A similar occurrence was reported to have happened at Tetbury, Gloucestershire, at the beginning of a thunderstorm on December 12, 1929. A "meteorite" fell with a blinding flash and simultaneously a very violent detonation. It struck the ground in the middle of a grass field near a flock of sheep, three of which were killed by the concussion. The hole was 3½ feet in diameter and looked just like a crater made by a "dud" shell, with a lip of raised turf as if the "meteorite" had come at a fairly pronounced slant from the north-west. The hole was dug out, but in this case no "meteorite" was found; but the observer still believes that there was something more than a flash of lightning.

According to a circumstantial account from Bolton, Lancashire, a meteorite fell there in 1928. The occupier of a small dwelling-house in the High Street was awakened just after midnight by a crash in his back yard and several fragments were picked up. One of these when sent for examination was identified as slag from an iron furnace. No doubt a neighbour had been disturbed by cats during the night.

The Hunstanton "meteorite," which struck a chimney during a violent thunderstorm in 1930, was in appearance not unlike a partly fused bar from a fire-grate. The Ramsgate "meteorite" of 1919 proved to be a hoax on a local magistrate and ended with a police-court fine.

Other materials sent or brought at various times to the Museum as "meteorites" include clinkers, furnace-slags, devitrified glass from glass furnaces, fused bricks from kilns, ferruginous nodules and boxstones from sandstones, various kinds of stony concretions, iron ore, lead ore, manufactured iron, ferromanganese, ferrosilicon, etc. Bright tin-white nodules of ferrosilicon (silicide of iron) have been found in gold-dredgings in British Guiana, and have also recently been offered as a meteorite from Greece. These have come from the spent calcium carbide of acetylene flares, and were matched exactly with specimens of ferrosilicon kindly sent for comparison by the Norwegian carbide works.

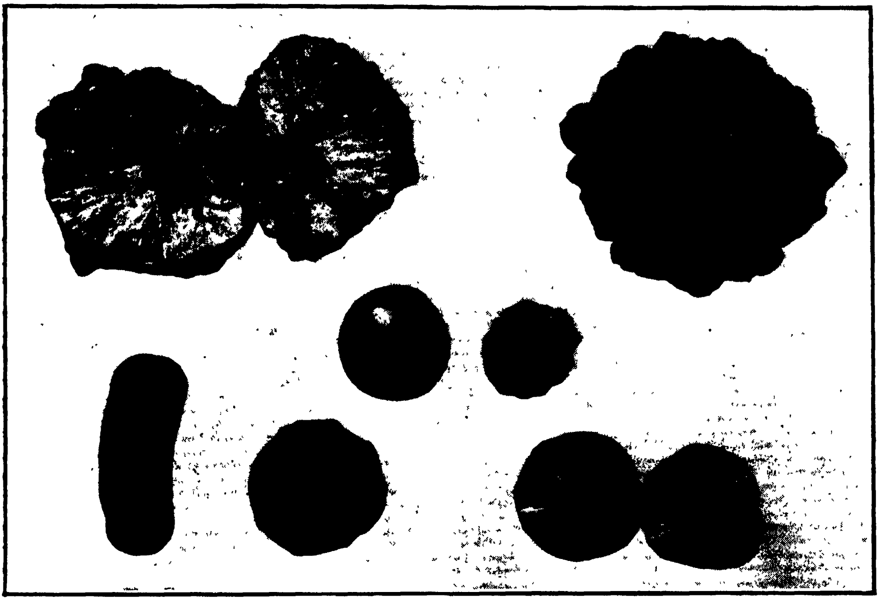


FIG. 5.—NODULES OF IRON-PYRITES ("THUNDERBOLTS"), from the Chalk at Folkestone, Kent. (⅓ natural size.)

In the London district the most prolific pseudo-meteorites are the nodules of iron-pyrites derived mainly from the Chalk. During the "pebble season," after the seaside holidays, these are brought to the Museum in considerable numbers. They are found at many places on the south coast and on the Chalk Downs, and have long been popularly thought to be "thunderbolts." They are heavy (specific gravity 5), and when broken open show a radiating crystalline structure with brass-yellow colour and bright metallic lustre. Fig. 5 shows a series of specimens, two of them broken open to show the internal structure, recently collected from the Lower Chalk outcropping on the foreshore below "The Warren" at Folkestone, Kent, where they are abundant and can be collected by the hundredweight.

These pyrites nodules have often been referred to the species marcasite, and indeed they have long been so placed in the Museum Collection. Iron-pyrites (or pyrite) and marcasite, it may be mentioned, are chemically identical, being dimorphous forms of iron disulphide (FeS_2); they differ in the form of their crystals, iron-pyrites being cubic and marcasite orthorhombic; but in other characters, colour, hardness, specific gravity, etc., they are very much alike. The difference between this pair of dimorphous minerals is much less obvious than between the pair diamond and graphite. In fact, unless distinctly developed crystals are present, it is often not possible to distinguish between them by ordinary means. Being opaque minerals, the simple test in polarized light cannot be applied; but no doubt a distinction could be made by the new metallographic method in reflected polarized light. Trials by the new X-ray method will also be made. In the meantime, amongst the large series of specimens (40 lb.) recently collected at Folkestone some sharply developed, regular octahedra have been found; and these can be seen to grade into the more irregular aggregates of distorted crystals, which at first sight suggest the habit of marcasite. The material of the nodules is thus proved to be iron-pyrites and not marcasite. How these nodules of iron-pyrites were formed and how they got into the chalk—questions invariably asked by visitors—is another story, but they certainly have nothing whatever to do with the countless thunderstorms that the white cliffs of Albion have weathered.

The pseudo-meteorites mentioned above can in all cases be matched with terrestrial materials, and, in the absence of convincing evidence that they have fallen from outer space, it is clearly saner to assume that they are of terrestrial origin. There is, however, one class of bodies which cannot be matched with known terrestrial materials (even amongst the stores of the British Museum), but, as they have never been observed to fall from the sky, they cannot yet safely be classed as meteorites. These are known as tektites—another story, told by Dr. G. T. Prior in the first number of this Magazine.

AN INTERESTING RELATIONSHIP BETWEEN A CRAYFISH AND A WATER BUG.

By W. E. China, B.A., Assistant Keeper, Department of Entomology.

Although the very numerous and striking modifications adopted by aquatic insects to maintain an air supply are more or less well known, the means whereby the eggs (especially of those species inhabiting stagnant water) receive proper aeration are less familiar and form an interesting subject for study. At present very little is known concerning the physiological aspect of the problem. It is assumed that in most cases a sufficient supply of oxygen is received from the air dissolved in the water, by means of diffusion through the membranous shell. Several instances are known, however, amongst the water bugs, in which special arrangements exist to supplement this source of supply. The necessity of such arrangements depends, of course, on the ecology of the species concerned, especially on the type of water frequented and the season of oviposition. The amount of dissolved air may vary considerably even in perfectly stagnant water where there is no mechanical aeration, depending directly on several factors, such as temperature and the type of vegetation present, and indirectly, therefore, on season of year, depth and volume of water and subsoil. The water in a shallow pool devoid of green vegetation on a hot day would be almost free from dissolved air, whereas that in a moderately deep pool with abundant green vegetation would be fairly rich in oxygen, owing to the quantity of gas given off during sunlight by the plants in the process of assimilation. Apart from variation in oxygen content of the water, the actual oxygen requirement of the eggs of water bugs must also be taken into account, and this apparently varies considerably.

The egg of the common water scorpion (*Nepa cinerea*), which has been known since the days of Swammerdam (1737), serves excellently as an example of special modification for respiration. *Nepa cinerea* (family Nepidae) prefers to live in very shallow muddy water, and is itself supplied with a long narrow tube at the extremity of the abdomen, through which it obtains an air supply from the surface while remaining submerged. The whitish-yellow egg is elongate oval in shape, about two and a half millimetres long, and provided with a circle of six to nine filaments at one end (Fig. 1*a*). It is inserted into the tissue of submerged decaying plants with the filaments projecting freely. These filaments are pierced by numerous closely placed canals connected to an air space between the inner and outer shell, and by this means oxygen is conveyed from the water to the yolk. The presence of these respiratory filaments greatly increases the area available for an interchange of gases. The eggs are usually inserted in rows. In species of the allied genus *Ranatra*, which live in deeper water, the egg is provided with only two filaments, but these are very long (Fig. 1*b*). As in the case of *Nepa*, the eggs are inserted into rotting vegetable tissue with the two filaments projecting divergently, but in this genus the eggs are more or less solitary.

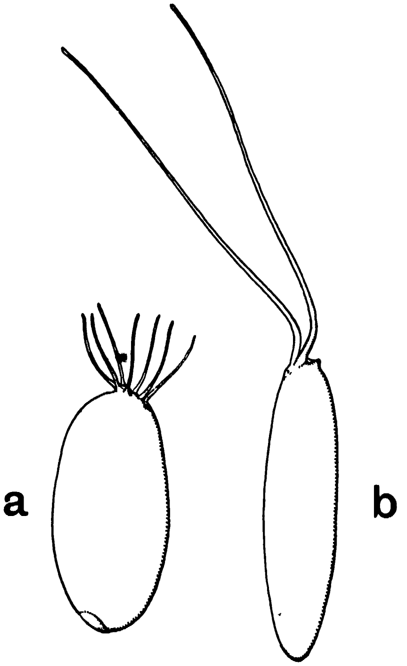


FIG. 1—(*a*) Egg of the common British "water-scorpion" (*Nepa cinerea*). (*b*) Egg of the elongate "water-scorpion" (*Ranatra linearis*); note the respiratory filaments.

Among tropical and sub-tropical giant water bugs of the family Belostomatidae we find an entirely different method adopted for the improvement of aeration of the eggs. In species of the genera *Sphaerodema*, *Abedus*, *Belostoma* and *Hydrocyrius* the eggs are actually laid on the back of the male (Fig. 2). The female seizes him by force and deposits her eggs on his broad back in a large cluster, the eggs being glued to the forewings and to one another so that usually it is impossible for the male to open his wings for flight. The male is thus forced to swim about, a veritable animated baby carriage, as Dr. Howard so aptly puts it, until the eggs are hatched. In this way the eggs receive a continual change of water and consequently aeration is greatly improved. This method, of course, has the additional advantage of affording the eggs some protection from their enemies.

It is, however, in the large family Corixidae (water-boatmen *) that we find the most interesting example of this type of aeration. As a general rule in this family the eggs are glued singly to any submerged object at a suitable depth. They are usually more or less globular in shape, pointed at the top, and arise by a very short stalk of glutinous matter from a disc-like attachment. In some species, such as the North American *Cymatia americana*, the stalk is quite as long as the egg itself. Water-boatmen are extremely numerous in suitable localities, and during the breeding season submerged objects become covered with their eggs. In Mexico there is one species (*Corixa mercenaria*) which is so abundant in the lakes around Mexico City that it is collected and used as food by the Mexicans, and it is this species which is exported to Europe by the ton for use as food for poultry and cage birds. Kirkaldy has estimated that each ton contains 250 million individuals. The Mexicans also from time immemorial have used the eggs of *Corixa mercenaria* as food. Thomas Gage, a traveller in Mexico, writing in 1625, mentions cakes made of a "kind of froth" from the Mexican lakes, which had an extensive sale amongst the inhabitants. During the breeding season bundles of reeds are placed in the shallow water, and these soon become encrusted with eggs, known to the Mexicans as "Axayacatl" (water-face); they are then withdrawn and the eggs detached. These are either cooked alone, when they are called Ahuauhtli (water-wheat), or mixed with meal and made into cakes which are eaten with green chilies. In view of the various theories advanced in connection with the supposed relationship between the civilizations of ancient Mexico and Egypt, it is extraordinarily interesting and significant to find that, according to Lichtenstein, the eggs of water-boatmen also serve as food in Egypt,

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* In Britain this name includes the Notonectidae, for which, however, it is preferable to use the American term "Back-swimmers," as being both descriptive and distinctive.

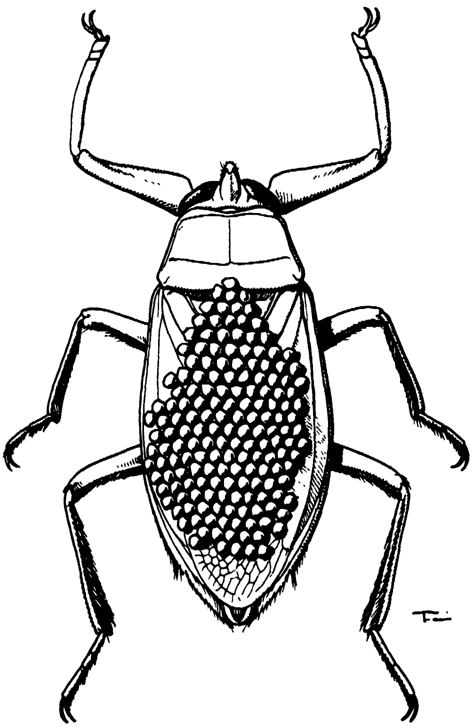

FIG. 2.—Male of a "giant water-bug" of Madagascar (*Hydrocyrius punctatus*), carrying eggs laid on his back by the female.

especially as, so far as is known, this is not the case in any other part of the world where these insects are abundant.

Returning to the problem of egg-aeration in this family, many of the stagnant ponds of the Mississippi Valley are inhabited by a small crayfish (*Cambarus immunis*). So long ago as 1876, Dr. S. A. Forbes, of the Illinois State Laboratory, noticed that about half of the specimens of this crayfish taken at midsummer from temporary pools in Central Illinois were more or less completely covered above by the eggs of a species of water-boatman, which he supposed to be *Corixa alternata.* In spite of prolonged search, he was unable at the time to find eggs on any other submerged objects. A few years later, however, he recorded the occasional finding of eggs on the shells of pond molluscs and on the carapace of another common Mississippi crayfish (*Cambarus acutus*). During the summer of 1910, Dr. James Abbott, of Washington University, unaware of Forbes's discovery, observed that many of the crayfish taken from a pond near Columbia, Missouri, were covered with eggs, which, when hatched out in aquaria, were found to be those of a new species of Corixid, which he proceeded to describe

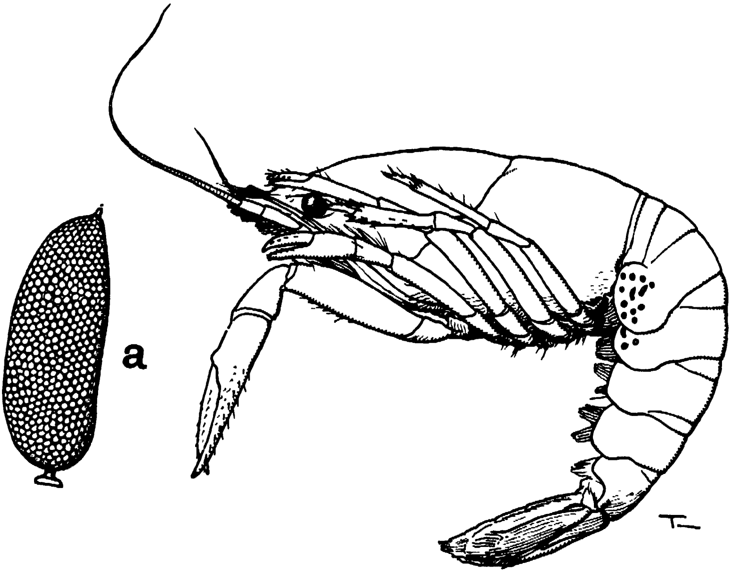

Fig. 3.—A North American crayfish (*Cambarus immunis*), bearing the eggs of a "water-boatman" (*Ramphocorixa acuminata*) on the sides of its abdomen. (*a*) Egg (enlarged) of the water-bug, showing disc-like attachment.

under the name *Ramphocorixa balanodis* * (Fig. 4). He found that eggs were deposited equally on both young and old specimens. Unlike Forbes, he was unable to find eggs on any other submerged objects. There is, of course, no proof that those found by Forbes on water snails, etc., actually belonged to the same species. Indeed, when one considers the difficulty of identifying the eggs themselves and the numerous species of North American Corixidae which are impartial as to the place of egg-laying, it seems highly probable that Forbes was mistaken, especially as he was never actually certain as to the identity of the Corixid concerned.

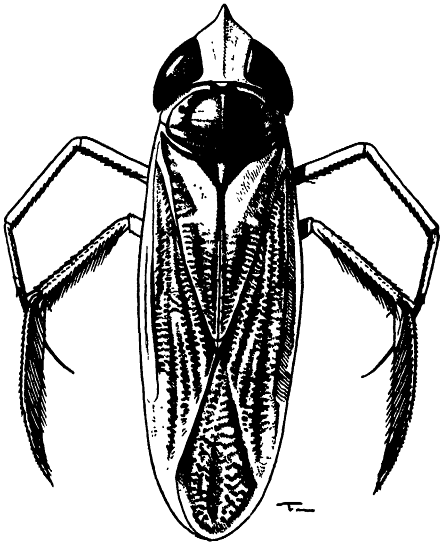

FIG. 4.—Male of a North American "water-boatman" (*Ramphocorixa acuminata*), which lays its eggs on a crayfish.

In 1878, Forbes, in surveying this remarkable method of oviposition, was forced to the following conclusion :—

"I can account for so strange a habit only by supposing that it is a 'provision of nature' to guard against the waste of eggs otherwise resulting from the drying up of the ponds. The crayfishes mentioned are distinctly aquatic species, and as one pond dries up they migrate to another, or to a neighbouring stream, bearing on their hospitable backs, as the shepherd bore Oedipus from impending destruction, the hopes of the distressed water bugs."

This seems a very plausible explanation, and, if true, the case would form a remarkable illustration of natural selection. Abbott regarded it as a symbiotic relationship in which both parties received a measure of protection. He wrote :—"The investiture of eggs commingled with debris certainly renders the crayfish less conspicuous, and it probably profits by the arrangement in much the same way as do various shore crabs, which are decorated with sponges, algae or coelenterates. That the water bug lessens the risks of racial extermination by the adoption of such a pugnacious protector may be too much to assume, but at any rate, whatever the utilitarian value of the habit, it must be of the same nature as that which obtains in the widely distributed genus *Zaitha*" (= *Belostoma*).

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* Later shown by Professor Hungerford to have been previously described by Uhler under the name *Corixa acuminata*.

More recent work on the subject has shown that neither of these explanations covers the whole of the facts. In such exceptional instances as those recorded by Forbes and Abbott, almost the whole of the crayfish except the back of the abdomen, where telescoping movements of the segments would damage them, is covered with a dense layer of eggs. Such conditions are probably brought about by overcrowding of the pond, possibly due to the results of drought. Normally the eggs are fewer in number and more or less inconspicuous, and Professor Hungerford, of Kansas University, has shown that when this is so the water bugs prefer to choose the sides of the first and second abdominal segments (Fig. 3); the reason apparently being that there is a constant current past this region, caused by the crayfish drawing the water beneath its carapace. It would seem then that the true explanation is connected with the aeration of the eggs, and, as suggested by Abbott, is thus related to the behaviour of the giant water bugs, in which the eggs are carried around by the male.

THE HOME OF THE EASTERN GORILLA.

By J. G. Dollman, B.A., Assistant Keeper, Department of Zoology.

Among the recent donations received by the Department of Zoology may be mentioned a large album of exceptionally fine enlargements made from photographs which were taken in the Birunga mountain district, lying to the north-east of Lake Kivu, east-central Africa, and deal with the home of the Eastern Gorilla (*Gorilla gorilla beringeri*). These photographs were taken by Mr. Marius Maxwell, so well known as the author of that important volume, "Stalking Big Game with a Camera," and are presented by him to the Museum. There are forty-two mounted photographs in the album as well as a number of loose prints.

Mr. Maxwell visited the Birunga mountains in the spring of 1925 in order to study the habits and habitat of the Eastern Gorilla. The Birunga range consists of a chain of volcanoes running at right angles across the main depression or Central Rift. The eight volcanoes consist of three groups: an eastern group, containing the mountains Muhavura, Mgahinga, and Sabinio, which stand close together and form the present

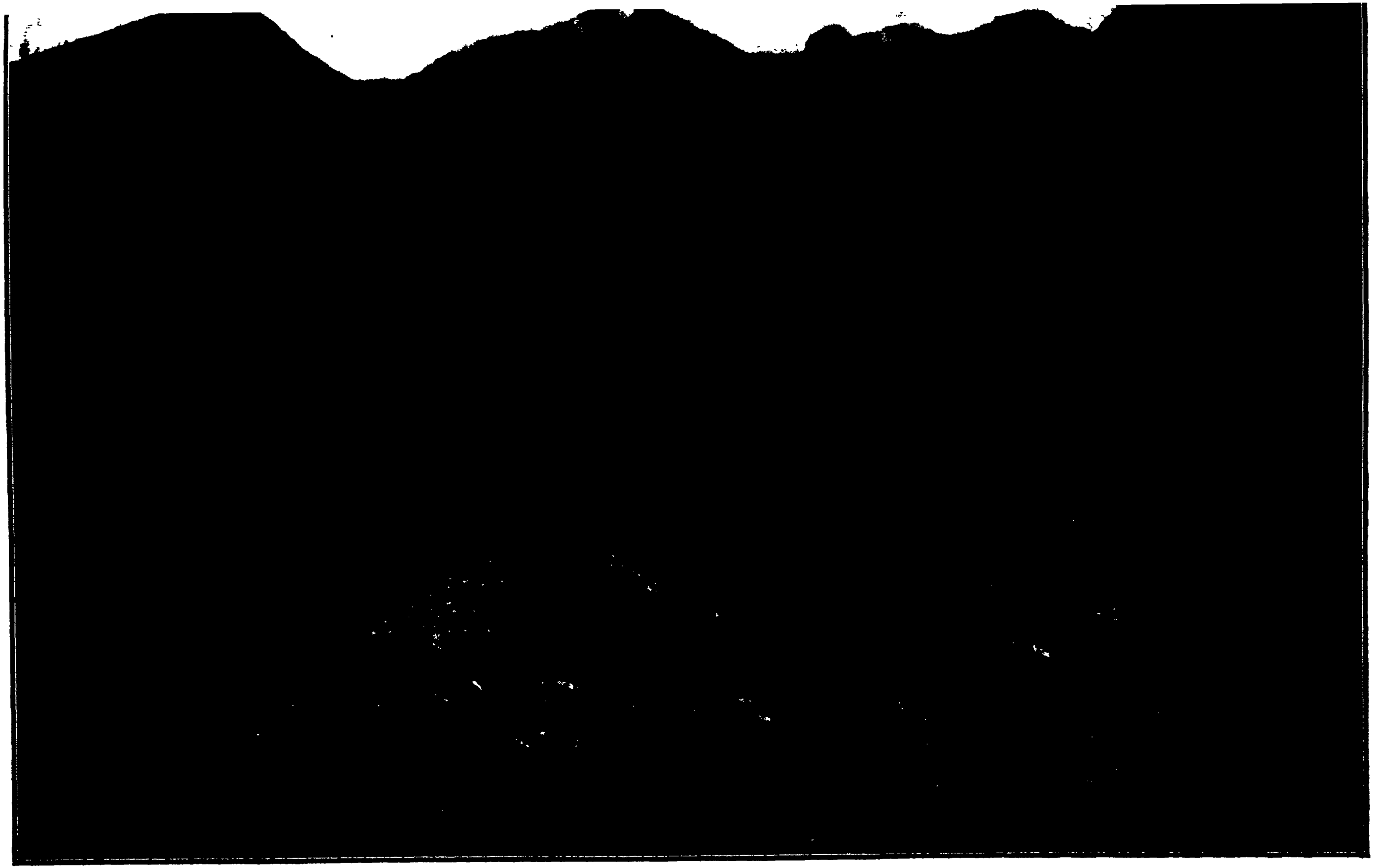

FIG. 1.—MOUNT SABINIO, BIRUNGA RANGE.

FIG. 2.—GORILLA SHELTERS AT BASE OF HAGENIA TREE.

boundary between western Uganda and the mandated territory known as Ruanda in the Belgian Congo; a central group, also consisting of three mountains, Visoke, Karisimbi, and Mikeno, situated in Congo territory; and a western group, consisting of the only two active volcanoes in the range, Niragongo and Namlagira. Of these mountains Karisimbi is the highest, reaching an altitude of 14,603 feet; Mount Mikeno, the most favoured home of the gorilla, is 14,385 feet in height; and the two active volcanoes, Niragongo and Namlagira, are 11,250 feet and 9,766 feet respectively, the latter being the lowest mountain of the range. Niragongo and Namlagira stand side by side and are detached from the other six mountains. The eruptions of Namlagira are at times very considerable and the noise of the explosions can be heard as far away as the shores of the Victoria Nyanza, about 175 miles to the east; Niragongo appears to be dying out.

Considerable difficulty was experienced by Mr. Maxwell in taking photographs in this district owing, firstly, to the density of the vegetation, and, secondly, to the fact that it is nearly always raining in these high altitudes. The vegetation on these Birunga volcanoes can be roughly divided into three distinct zones. The lower belt, from 7000 to 9000 feet, consists of bamboo forest interspersed with large trees and with a dense undergrowth. The intermediate zone, from 9000 to 12,000 feet, consists principally of hagenia trees (*Hagenia abyssinica*) with an undergrowth consisting of giant lobelias, docks, sorrels, hemlocks, and similar plants. The hagenia trees offer excellent places for the construction of shelters for the gorillas, the roots being hollowed out and the recesses thus formed curtained over with luxuriant creepers. The highest zone, commencing at an altitude of 12,000 feet, exhibits an equatorial, sub-alpine, and alpine flora, consisting of giant heaths (*Erica arborea*), lobelias, and giant groundsels (*Senecio johnstoni*), all festooned and covered with ragged beard-moss.

The album opens with a distant view of the Birunga Range taken from the plains, which are from 5000 to 6000 feet above sea-level; on a clear day—a rare event in the Birunga district—the mountains form an imposing spectacle. There follow photographs of giant heaths, the hagenia forest, and studies of the vegetation at 11,000 to 12,000 feet showing the sub-alpine flora, the giant lobelias and clotted masses of beard-moss being very evident. There are also good photographs of Mount Mikeno, showing its double-toothed summit, and Mount Sabinio (Fig. 1). The series also contains some photographs of

FIG. 3.—GORILLA BED, CONSTRUCTED IN THE FORK OF A TREE FOUR FEET FROM THE GROUND.

Fig. 4.—Gorilla Bed, taken by Major P. H. G. Powell-Cotton in the South Cameroons, 1929.

the gorilla, the best of which are one of a female gorilla, which has been startled by the photographer and is seen making off in the foreground, carrying its young on its back like a jockey on its mount, and one showing the head and shoulders of an old male gorilla, peering out from a dense curtain of tropical vegetation. There are also photographs of dead gorillas shot by the late Commandant Arrhenius for the Natural History Museum at Stockholm, and in addition two photographs showing captured young gorillas, one of which was afterwards sent to the Zoological Gardens at Antwerp.

Some of the most attractive photographs in the collection are those of gorilla shelters (Fig. 2) constructed at the bases of the old hagenia trees. In one of these photographs a dead leopard is seen lying on the foliage above one of the shelters; this animal was shot by Mr. Maxwell while it was stalking the young gorillas, which frequently form an important part of the leopard's diet. Perhaps the most interesting photograph of the whole series is one of a gorilla bed, or "nest" constructed in the fork of a tree (Fig. 3). This bed was about 4 feet from the ground; the older gorillas appear to prefer their beds constructed on the ground itself, probably because they have little to fear from the attacks of leopards, which, apart from man, are practically the only foes the gorilla has to deal with. A photograph of a West African gorilla's bed (Fig. 4), taken by Major P. H. G. Powell-Cotton, is also reproduced here for comparison; this bed was brought to England intact and will be included in a group of gorillas in their natural surroundings in the Quex Museum. An enlargement of this photograph has been presented by Major Powell-Cotton to the Department of Zoology.

This series of photographs, together with those taken more recently by Lord Howard de Walden, form a very valuable and interesting record of the habitat of the Eastern Gorilla, and they will be of the greatest service in the construction of the group of Eastern Gorillas about to be assembled in a case in the Upper Mammal Gallery.

THE VERNAY-LANG KALAHARI EXPEDITION.

By J. G. Dollman, B.A., Assistant Keeper, Department of Zoology.

Mr. A. S. Vernay has recently presented to the Museum about sixty specimens of large ungulates, lions and baboons, the specimens consisting of complete skins and skulls; they were all shot during the Vernay–Lang Expedition to the Kalahari.

The greater part of this collection has been placed in the study series, which, practically for the first time on record, has been enriched by the addition of good series of specimens of the various species of large ungulates. As a general rule, with mammals of this size, the Museum has to take what it can get, and this rarely means regular series of specimens from one locality. Herein lies the importance of Mr. Vernay's gift; the collection containing good series of such large antelopes as blue wildebeest, gemsbuck, impala, Cape hartebeest, springbuck and tsessebe. In addition there are good examples of eland, giraffe, gnu, kudu, wart-hog, zebra, lechwe, lion and baboon. The lion is represented by two skins and skulls, a male and female, and the skull of a lioness. The giraffes, which are apparently referable to the southern race (*Giraffa camelopardalis capensis*), are two in number, one a fine old bull and the other a good female, the latter with complete skeleton.

The collection contained a specimen of the lechwe, a photograph of which is reproduced here; this animal has been mounted in the Rowland Ward Studios and will take the place of a very old and badly mounted example shot by Selous many years ago. This latter example, which might be said to be " stuffed " rather than mounted, will be withdrawn from exhibition, unmounted and placed in the study series.

The lechwe (*Onotragus leche*) is an antelope which occupies a position intermediate between that of the waterbucks (*Kobus*) and the true kobs (*Adenota*); it is also intermediate in size between these two groups, being rather larger than the kobs and smaller than the waterbucks or defassa. Up till quite recently it was customary to refer the lechwe and its allies to the genus *Kobus* which contained not only the waterbucks but the kobs as well. As, however, several differences of generic rank exist between lechwes and waterbucks on the one hand, and waterbucks and kobs on the other, the lechwes and kobs are now placed in two separate genera, *Onotragus* and *Adenota*.

The lechwe stands about 40 inches at the shoulder and the record pair of horns measure some 34⅞ inches along the front curve, with a tip to tip interval of only 14⅝ inches; the latter dimension is subject to considerable variation. All the largest horns are from specimens shot in Northern Rhodesia; those from the south of the Zambesi are, as a rule, considerably shorter than the northern specimens, rarely exceeding 24 inches in length. Mr. Vernay's lechwe stands some 39 inches at the shoulder (as mounted) and carries horns which measure 23½ inches in length with a tip to tip interval of 9¾ inches. The record specimen, referred to above, is a North-west Rhodesian animal and has the horns less widely spread than any other large-horned lechwe from north of the Zambesi; the average tip to tip interval in Northern Rhodesia is about 20 inches, and the maximum interval as much as 26½ inches.

Lechwe (*Onotragus leche*).

In colour the lechwe resembles a pale-coloured kob, being a kind of straw-tinted buff above and white below, the flanks and thighs being rather paler than the back. The lower parts of the limbs are usually dark brown down their fronts, this colour sometimes extending up the front of the fore-limbs nearly the whole length of the leg.

The typical locality of the species is the Zonga valley, near Lake Ngami, so that there can be little doubt but that the present specimen represents the true *Onotragus leche.* The animal is fairly widely distributed, extending northwards from the type locality across the Zambesi into Northern Rhodesia and still further north into the southern borders of the Congo. Eastwards it penetrates into Nyasaland, and in the west reaches Angola. From the country between Lakes Mweru and Bangweolo, in Northern Rhodesia, there has been described under the name of *Onotragus robertsi* a lechwe which differs from the typical form in having patches of black on the sides of the neck and shoulders; it is probably a partially melanistic phase of *Onotragus leche.*

The name *Onotragus smithemani* has been given to yet another animal from near Lake Mweru, the distinguishing characters being that in old males the coat is nearly black and the hair of the back is reversed. Young males and females are coloured much the same as the typical lechwe. The horns of this black lechwe exhibit a more distinct double curve than do those of the true lechwe, being somewhat intermediate in this respect between *Onotragus leche* and *Onotragus megaceros,* the Nile lechwe or " Mrs. Gray's Kob." This latter animal, which was formerly known by the name " *Kobus maria,*" was named after the wife of Dr. J. E. Gray, a former Keeper of the Zoological Department, and the name of " Mrs. Gray's Kob " is known in sporting circles all over the world. So much so is this the case that although big efforts have been made to eradicate the names " *Kobus maria* " and " Mrs. Gray's Kob " in favour of *Onotragus megaceros* and the Nile lechwe, one still hears this animal referred to as " Mrs. Gray " ninety-nine times out of a hundred.

The Nile lechwe agrees with the black lechwe in having the hair of the back reversed, but the horns are heavier and exhibit the double curve to a much greater degree; further, the horns are ringed nearly to their tips. In colour the old males are exceedingly handsome, the body being blackish-brown, the sable-like tint standing out in vivid contrast against the creamy-white markings on the sides of the body and face. The three kinds of lechwe, the typical lechwe, the black lechwe and the Nile lechwe, all inhabit the low-lying swampy districts surrounding large rivers and lakes; the Nile lechwe is found in the papyrus swamps of the White Nile and other rivers in the Bahr-el-Ghazal.

RECENT IMPORTANT ALTERATIONS AND ACQUISITIONS.

THE Extension of the New Spirit Building which has been erected for the use of the Department of Entomology out of funds provided by the Empire Marketing Board (*v*. p. 28) has been brought into use.

An exhibit has been placed in the Central Hall of historical botanical specimens and manuscripts in connexion with the celebration of the tercentenary of the discovery of the medicinal properties of the cinchona bark (*v*. p. 17).

Department of Zoology.

A number of mounted specimens of animals have been presented by the Rowland Ward Trustees (*v*. p. 1).

Two collections of monkeys and flying squirrels (scaly-tails) from the Cameroons have been acquired by purchase. The flying squirrels represent two species, *Anomalurus beecrofti* and *Anomalurus erythronotis*, both being comparatively rare members of the genus. The monkeys include Gray's guenon (*Cercopithecus grayi*), the grey genon (*Cercopithecus nictitans*) and white-collared mangabey (*Cercocebus torquatus*). A further purchase includes the skins and skulls of three specimens of a dwarf race of African buffalo from the Cameroons; the series including an adult male, female and young individuals. They would appear to represent a race of buffalo hitherto undescribed and new to the collection.

A coloured cast of a large electric eel (*Electrophorus electricus*) which recently died in the aquarium of the Zoological Gardens, where it had lived for several years, has been presented by Lord Rothschild.

A Greenland narwhal; presented by the Government of Greenland. The specimen, which is a male 10 feet 3 inches in length, with a tusk 14½ inches long, was sent from Greenland packed in salt, and arrived at the Museum in excellent condition. A plaster cast of the animal has been prepared, and will be exhibited when the new Whale Room, now under construction, has been completed.

The skin and skull of a remarkably pale form of Thomson's gazelle (*Gazella thomsoni*) from Kenya Colony; presented by H.H. Maharao Sri Sir Khengarji Sawai Bahadur, G.C.S.I., G.C.I.E., Maharrao of Cutch.

The record pair of female elephant tusks from Uganda has been deposited on loan by His Excellency Sir William Gowers, K.C.M.G., Governor of Uganda. The tusks belonged to an animal shot by the late Mr. P. C. Pearson, a Game Ranger in Uganda. (*v*. p. 42).

Among recent purchases are a small collection of mammals for the study series, from the Peruvian Amazons, including two examples of the black saki (*Chiropotes satanas*).

Department of Entomology.

Egg-capsule of a species of *Mantis*, found by Dr. R. S. Taylor at Burao, British Somaliland, and presented by him. The egg-capsules of this insect, which resemble small bladders, whitish in colour and rather less than an inch in length, are attached to the twigs of bare, leafless acacias, fully exposed to the heat of the sun. Though easily seen, they do not appear to be attacked by either birds or ants.

Male specimen of the rare ichneumon fly, *Catadelphus obsidianator*, Brullé, bred by the donor, Mr. Frederick D. Welch, F.Z.S., from the chrysalis of a North American Hawk-Moth, *Calasymbolus excaecatus*.

Upwards of six hundred insects of various orders from Western and Central France, collected and presented by Mr. F. J. Cox.

Set of forty photographs of North American plant-galls; presented by the Salisbury, South Wilts and Blackmore Museum.

A collection of over 1400 specimens of two-winged flies from the Malay Peninsula and from Mt. Kinabalu, British North Borneo, obtained by Mr. H. M. Pendlebury in April 1929; presented by the Federated Malay States Museum. The flora and fauna of Mt. Kinabalu are of very great interest, since many plants and animals (including even birds) found there do not occur anywhere else in the world, and possibly represent old forms of life which have persisted on the mountain during successive ages, while most of the island, after being submerged by the sea, has been re-elevated and then re-colonised by the tropical jungle as it is to-day. The collections of flies brought back by Mr. Pendlebury are the first to have been made on the mountain, and are therefore of special importance, including as they do examples of a great many species new to science. Some of these, as might perhaps be expected, show affinities with the mountain fauna of the Philippine Islands. Mt. Kinabalu (13,455 feet), the highest peak in the Malay Archipelago, has not often been climbed, although the ascent is not difficult.

A series of examples of no fewer than five species of the remarkable Cape stagbeetles of the genus *Colophon* including the types of four species discovered by the donor and new to the collection; presented by Dr. K. H. Barnard. These strange insects have hitherto remained almost unknown, since they are confined to mountain summits in the south-western area of the Cape Province, South Africa, which are very difficult to visit. They are unable to fly, and each form is completely isolated from the other species. Stagbeetles are wood-feeders, and the occurrence of representatives on treeless South African mountain-tops is at present unexplained.

Department of Geology.

A fish and two palms from the Middle Eocene beds of Bolca, near Verona; purchased. The fish is a fine example of a rare extinct genus *Urosphen*, related to the living Flute-mouths; it is 2½ feet in length, and is the largest and one of the best preserved specimens known. The elongated tube-like mouth and the peculiar tail fin are well shown. The palms, which are both on slabs about 6 feet in length, are almost complete specimens of small fan-palms, with stems bearing four and five leaves respectively, which have been fossilized almost in the position of growth. Opportunities for acquiring such specimens are now very rare, owing to the working out of the beds in which the fossils occur.

Other purchases include Pliocene voles from Hungary; undescribed fishes from the Karroo of South Africa; and a plaster cast of a skull of Pekin Man. The last is of especial interest, both for being the first skull of primitive Man found in China, and because of its intermediate position between the Java Man—*Pithecanthropus* and the Piltdown Man—*Eoanthropus*.

Department of Mineralogy.

A piece of meteoric iron, weighing 5½ lb., sawn from the gigantic Hoba mass, near Grootfontein, South-West Africa (the largest known meteorite); presented by the South-West Africa Company, with the permission of the Department of Mines and the Administration of South-West Africa.

Two green diamonds from the New Modderfontein gold mine, Witwatersrand; presented by the Rand Mines, Ltd.

Samples of the new minerals cooperite and stibiopalladinite of the platinum group, from the Bushveld area, Transvaal; presented by Mr. R. A. Cooper and H. R. Adam respectively.

Piece of a meteoric stone found in 1928 in a stone cist amongst the prehistoric ruins of the Elden pueblo in Northern Arizona; presented by Mr. A. J. Townsend, of Flagstaff, Arizona.

Minerals from the copper mines of Katanga and Northern Rhodesia collected by Mr. G. Vilbert Douglas; presented by the Rt. Hon. Sir Auckland Geddes.

Sample of sand containing Rheingold (not before represented in the collection); presented by Prof. E. A. Wülfing, of Heidelberg.

Crystallized iron sulphates (melanterite, römerite, and coquimbite) from Kalavasso, Larnaka district, Cyprus; collected and presented by Mr. A. Broughton Edge.

A further instalment of Mr. F. N. Ashcroft's collection of zeolites, representing occurrences in Nova Scotia, Alaska, New South Wales, and Sardinia; also from Mr. Ashcroft a fine group of crystals of barytes from Roumania; presented.

Purchases include etched crystals of scapolite, pale yellow in colour and of a gem quality, from Brazil; a large crystal and a 2-inch cube of pitchblende from Ontario; and a series of Spanish minerals, several of them from unrecorded occurrences.

Department of Botany.

152 water-colour paintings of which 145 are of North American wild flowers and 7 of toadstools; presented by Mrs. Hosea B. Morse. The paintings are of natural size, and many of them are on toned paper. All necessary botanical information is given as to locality, dates and so on, and often there are interesting notes of biological interest. The gift makes a valuable addition to the collection of original paintings in the Department of Botany.

Three bundles of Chinese fungus *Cordyceps sinensis;* presented by the Rev. J. W. Sprockley. This fungus attacks the larva of an insect, which eventually dies, and its interior is gradually absorbed until it is practically a solid mass of mycelium, though it retains its shape. Out of one end the fertile part of the fungus grows. The Chinese call it by different names meaning " winter insect " and " summer plant." Such a wonder naturally has medicinal properties, and the fungus is a celebrated drug. It is sold in bundles tied up with thread, and, as it is found apparently only on the Thibetian border, is very much valued, though it is probably not so rare as has been supposed.

A quantity of hazel nuts of immediate post-glacial date, from Loch Troig, Inverness-shire; presented by the North British Aluminium Co., Ltd. Loch Troig, now 784 feet above sea level, lies at the eastern end of the Ben Nevis range, and has been used as a reservoir in connexion with the recent hydro-electric developments. Last year, owing to an unusual spell of dry weather, the level of the lake was reduced and a thick bed of dark-coloured hazel nuts was seen at the North (exit) end of the lake at 741 feet above sea level. Heavy rains, refilling the lake, washed the nuts from the seam, and, their kernels being decayed, they floated on the surface until that part of the lake was black with them. As there are now no hazel bushes in the neighbourhood, the nuts suggest that when they grew the climate in the district was warmer. They probably date from the warm period which occurred immediately after the last Glacial epoch.

A collection of 101 sea weeds collected during Sir J. Ross's voyage of the

Erebus and *Terror* to the Antarctic (1839–43); presented by Miss Jessie Lefroy. The Department of Botany already possesses the flowering plants of the expedition to which Dr. (afterwards Sir) J. D. Hooker was naturalist. Many cryptogams were received from 1845 to 1854, and a further set was bequeathed together with his Arctic collection by Dr. R. McCormick, Surgeon to the expedition, in 1890. The collection now added is valuable in extending the series, and has an additional interest in that it was originally presented to Lady Franklin.

A spirit collection of 20 Asiatic and 7 tropical African Podostemaceae; presented by Professor F. A. F. C. Went, of Utrecht. Professor Went is an authority on the biology of this group of flowering plants, which has as its habitat rapidly flowing streams and is of great morphological interest on account of the peculiar modification of its vegetative parts, which simulate those of algæ and liverworts.

A collection of 734 specimens of flowering plants from Sierra Leone; present-by Mr. F. C. Deighton.

A collection of 35 spirit specimens of Malayan orchids and 24 British orchids; presented by Mr. C. E. Carr.

JUBILEE (QUINQUAGENARY) CELEBRATION OF THE NATURAL HISTORY MUSEUM.

It was on April 18, 1881, that the then new building at South Kensington was first opened to the public, and the fiftieth anniversary of that date will be reached a few days after the publication of this number of the Magazine. The Trustees of the British Museum consider the completion of half a century to be an event of some importance and propose to recognize it in a fitting manner. The spring is not a convenient time of the year for a celebration to which representatives of far-distant institutions should be invited; moreover, the British Association for the Advancement of Science has decided to hold its centenary meeting in London in September next. The Trustees have accordingly decided to defer the Jubilee Celebration of the Natural History Museum to the end of the British Association's meeting.

It must not be forgotten that, although the building at South Kensington is but fifty years old, the collections contained in it go much further back. Important natural history specimens were included in the great collection of Sir Hans Sloane, the acquisition of which for the nation in 1753 led to the foundation of the British Museum, and when the Museum was opened in 1756 one of the three Departments into which it was divided was the Natural History one. It was, however, a kind of hotchpotch and contained any object apart from books and manuscripts. In 1806 it was split into two Departments: Natural History and Modern Curiosities, and Antiquities and Coins. In 1835 the collection of plants assumed such importance owing to the accession of Sir Joseph Banks's herbarium that a Botanical Branch was separately constituted, and two years later, in 1837, two further Branches—the Zoological, and the Mineralogical and Geological—were formed. In 1856 the Branches were raised in status to Departments, and in the following year, 1857, the double Department was resolved into two, the Geological and the Mineralogical. There was no further increase until 1913, when the rapidly growing importance of the insect collections necessitated the separation of the Entomological from the Zoological Department.

The building at South Kensington was begun in 1873 and finished in 1880. The Departments of Geology, Mineralogy, and Botany were soon transferred, but the removal of the Zoological Department was a far more laborious undertaking, and was, indeed, not completed until 1886.

BOOK NOTICES.

The Life of the Ant. By MAURICE MAETERLINCK. Translated by Bernard Miall. Pp. 192. (London: Cassell and Co., Ltd. 1930. 6*s.*)

THIS work, which consists of an Introduction, ten chapters dealing with different phases in the life of ants, an epilogue, bibliography and index, may briefly be described as a fairy tale or phantasy, interlarded with much moralizing on the character of ants, and as to whether they are better, more moral, or happier beings than man, and the like. As has been stated elsewhere, what Maeterlinck writes about are not really ants, but immortal nurslings of his own imagination—creatures which do not and never did exist.

We personally have no objection to his theories (one theory is often as good as another), his lofty imagination, or poetical analogies; but when he descends to what are supposed to be facts we fall foul of him. Alas! There are so many grievous inaccuracies. Darwin's words, quoted by us in another place, are very applicable here:—"Accuracy is the soul of Natural History. . . . Absolute accuracy is the hardest merit to attain, and the highest merit. Any deviation is ruin."

The worst of a compilation of this sort is that, being a semi-popular book, it will circulate much more freely than any accurate scientific work, and the reading public will remember the misstatements long after the harmless theories have been forgotten. Yet some at least of the misstatements occurring throughout the book should be corrected.

It is quite wrong to speak of ants as Fossorial Hymenoptera; the Fossores consist of the *Mutillidae*, *Scoliidae*, *Pompilidae*, etc.

The *Myrmicinae* and *Formicinae* of the subfamilies of ants are said to be alone cosmopolitan, whereas the *Ponerinae* and *Dolichoderinae* are likewise generally distributed.

The males of ants do not discard their wings after the nuptial flight.

In small nests of ants there will be generally only one queen, not two or three.

The social pouch, or crop, of an ant does not occupy anything like four-fifths of the abdomen; and only in the "honey-pot" ants does it thrust aside all the other organs.

It is stated that a queen ant after she has brought up her first brood does nothing but lay eggs night and day. This is by no means the case, though her ovaries annually undergo a temporary increase in size, and she lays eggs during part of the year.

The female ant is not equipped with tools far less perfect than those of the workers; on the contrary, she possesses more powerful jaws and legs, a larger brain and greater stamina.

Huber was not the first to describe the proper and normal birth of a colony; on the contrary, he failed to do so. It was Lord Avebury (Sir John Lubbock) who, in 1876, first demonstrated that females, after the marriage flight, are capable of bringing up a colony unassisted.

The "nymph" of an ant does not, and could not, weave itself a cocoon.

The old story that the nests of *A.* (*D.*) *fuliginosus* were excavated in wood which was stained black by the ants' acid is repeated here. It is true that Huber, and other old writers, thought so, but Meinert so long ago as 1861 proved that the nests are made of "carton" constructed by the ants, and every subsequent observer since has published the fact.

No ant possesses two pairs of jaws.

It is stated that Huber could not have known of Réaumur's "pounce boxes," since Réaumur wrote fifty years later! Réaumur, who died in 1757, was writing in 1740, and Huber in 1810.

We are told that in ants the sting is tending to become atrophied; this is by no means the case in the *Ponerinae* and other ants bearing strong stings, and very few of them are reluctant to use this weapon. Some of our common species of *Myrmica* sting most virulently when interfered with, and Wheeler describes the sting of a species of *Pogonomyrmex* (*Myrmicidae*) as being remarkably severe, the fiery, numbing pain lasting for hours.

The *Leptanillinae* are described as being large and formidable ants, which nothing can resist. As a matter of fact they are amongst the smallest of ants, and lead a hidden, subterranean life, in small colonies under deeply imbedded stones.

The fact that certain ants use their larvae to spin silk and sew together the leaves that form their nests, is said to be the only example among insects of the employment of a tool. Wheeler, however, has given an excellent description of how a solitary wasp (*Sphex urnarius*) actually stamps down the filling of its burrow with a small carefully selected pebble, held in the mandibles and used as a hammer. This astonishing behaviour, which has been carefully observed by no fewer than nine investigators, can hardly, as he truly remarks, be reduced to simple physiological reflexes.

The *Antennophori* are said to be a "kind of louse," when in fact they are mites (*Acorina*).

The Birds of Tropical West Africa, with special reference to those of the Gambia, Sierra Leone, the Gold Coast and Nigeria. By D. A. BANNERMAN, with Preface by the Right Honourable LORD PASSFIELD, Secretary of State for the Colonies. Vol. I., pp. lxxv + 376; 10 coloured plates; 119 text-figs. Published under the authority of the Secretary of State for the Colonies by the Crown Agents for the Colonies. (London. 1930. Large 8vo. 22*s*. 6*d*.)

ALTHOUGH this book is not published by the Trustees of the British Museum, the work of preparing it has been done in the Bird Room, where the author has been for a good many years one of the unestablished staff. It is a matter for congratulation that the generosity of the four West African Colonial Governments has made it possible for the author to set forth the results of his long-continued work in so worthy a form, with adequate illustration and printed in a way that makes it a pleasure to read.

The book is planned to be of use to those who have no previous knowledge of ornithology, while at the same time it is sufficiently detailed and comprehensive to be of value to the scientific student. The introduction is particularly addressed to the beginner, to whom the instructions how to use the " keys " for the identification of birds will be very helpful. The chapter entitled " The Relationship of the Vegetation Belts to the Distribution of Bird Life in Tropical Africa " is accompanied by three coloured maps, showing respectively the vegetation belts, the avifaunal districts and the orographical features of West Africa. This section will be found worthy of attention not only by ornithologists but also by all interested in the distribution of African animals and plants. The chapter on " Ornithological History " gives an account of the most important field work done in the West African Colonies from 1690 up to 1929.

In the systematic account, which, beginning with the Struthioniformes, is carried in this volume as far as the Galliformes, an abbreviated synonymy is given for each species or subspecies, followed by a technical description. A feature of the book is the paragraph on " Field Identification " given for each bird. In attempting to discover the name of a bird that has only been seen alive and at a distance, the details of the technical description often give little help. The author has therefore supplemented this by calling attention to distinctive peculiarities of colour, attitude, flight and so forth which may be observed in the field. He has had much experience in watching birds in many parts of the world and has made use of notes supplied by several ornithologists specially familiar with the West African birds. As a result he has been able to summarize the salient features of each bird in a fashion that can hardly fail to prove of the greatest practical use.

The eight coloured plates of birds are reproduced from paintings by the late Major Henry Jones, by permission of the Council of the Zoological Society. Of the 119 figures in the text a few are copied from other publications; the remainder are by the well-known bird artists, H. Grönvold, F. W. Frohawk, and Roland Green, and by Lieut.-Col. W. P. Tenison, D.S.O., whose skill in depicting animals of widely different character is well known in the Museum.

It is not every author of a work on Natural History who can hope for a preface by a Cabinet Minister. It would be unbecoming for a Civil Servant to comment on the observations of the Secretary of State for the Colonies, but we may venture to quote from him a paragraph which will surely be welcomed by all who care for the advancement of science :—

" It is a frequent charge against Governments of all complexions that they do little to encourage abstract science, and when funds for necessary material development are all too scarce the charge is perhaps not without foundation. But the debt of man to science of all kinds is more and more widely recognised, and the devotion of a comparatively small sum to a work of the nature of the present book may perhaps be held to be an earnest of better and more things to come."

STAFF NEWS.

On March 10 the degree of Doctor of Science was conferred *honoris causa* by the University of Oxford upon Mr. Charles Davies Sherborn in recognition of the services which he has rendered to science by the compilation of his great work—the "Index Animalium." Its object is to record the scientific names given to animals since the time of Linnæus, with the date and place of publication of each. The Trustees of the British Museum early recognized the value of the work and for many years past have attached Mr. Sherborn to the Staff of the Museum to enable him to prosecute his self-imposed task. The first volume, which covers the period from 1758 to 1800, was published by the Cambridge University Press in 1902. The next section, which is to deal with the half-century 1801–1850, was a far more formidable task, and its progress was hampered by the outbreak of war and the subsequent financial difficulties. For a while it appeared as if its publication would be impracticable. However, in 1921 the Trustees resolved to assume the responsibility themselves; the first part appeared in the following year, and the work is now expected to be completed within the next four or five years.

The Public Orator (Dr. A. B. Poynton) presented Mr. Sherborn to the Vice-Chancellor in the following words: "Trado vobis hodie operis immensi conditorem qui sponte atque ultro consilium Plinianum Pliniana industria exsecutus nomina animalibus ab investigatoribus post Linnæum per centum annos subinde imposita perquisivit, singulis versiculis ad suos quodque fontes rettulit, omnia denique per seriem litterarum ordinata singulari fide ac diligentia typis mandavit. Quem indicem ut conficeret, innumera pæne volumina, commentariola, doctarum societatium acta, plurimis linguis conscripta rimatus tanta sagacitate et prudentia digessit, ut inter omnes physicos tam peregrinos quam nostrates constet neminem hoc auctorem bibliographiæ zoologicæ peritiorem exstare. Itaque nescio utrum Atlanti eum comparem, cum solus humeris suis per decem fere lustra tantum onus susceperit; an Argo, ut cuius nulla oculos ne minutissima quidem indicia fefellisse videantur; an Ariadnæ, ut qui Zoologis omnibus quique Zoologiæ ex penu materiam scientiarum suarum depromant, in tot litterarum labyrinthis fila certissima præbuerit. Nos igitur, Minervæ tam lætioris quam severioris famuli, totiens experti non cuiusvis esse hominis ne unius quidem libri indicem vere utilem conficere, gratulamur Musei Britannici Fiduciariis quorum auspiciis volumina illa utilitate sua amplitudinem æquantia in lucem prolata sint, ipsumque indicis patrem, labore quem sibi alieni potius quam sui commodi studiosus imposuit felicissime perfecto, ut muneris quovis Academico, quavis Academia dignissimi auctorem, libenter laurea Academica decoramus. Itaque præsento vobis vigilantissimum Zoologiæ antistitem, Carolum Davies Sherborn, ut admittatur ad gradum Doctoris in scientia honoris causa."

The Vice-Chancellor (the Master of Pembroke) welcomed Mr. Sherborn as "Vir impigerrime, qui, per tot annos cum summo studio, iudicio, eruditione scientiæ zoologicæ devotus, opus edidisti per totum orbem maximi æstimatum."

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The Trustees have made the following appointments to Deputy Keeperships: Mr. G. C. Robson in the Department of Zoology; Mr. N. D. Riley in the Department of Entomology; Mr. W. N. Edwards in the Department of Geology; Mr. W. Campbell Smith in the Department of Mineralogy; and Mr. A. J. Wilmott in the Department of Botany.

Mr. Guy Coburn Robson was educated at Forest School, Walthamstow, and New College, Oxford, where he held an exhibition in classics. He obtained a second class in Classical Moderations in 1908, and a first class in the Final School of Natural Science in 1910, in which year he was awarded the University Biological Scholarship at Naples. In 1911 he joined the staff of the Department of Zoology as Assistant in charge of Mollusca and Brachiopoda. He was Secretary of the Challenger Society from 1921 until 1928, and has been President of the Malacological Society since 1930. He was Moderator in Natural

Science at Oxford University in 1924–25 and 1926–27, and External Examiner in Biology at St. Andrews and Reading Universities 1925–31. He is Joint Local Secretary of Section D (Zoology) for the meeting of the British Association for the Advancement of Science in London next September. During the war he served in the Royal Garrison Artillery (1916–18).

Mr. Norman Denbigh Riley, who was educated at Dulwich College and the Imperial College of Science and Technology, was appointed to an Assistantship in the Insect Section of the Department of Zoology in 1911, and was placed in charge of the collection of butterflies; in 1913 this Section was raised in status, and became the Department of Entomology. Mr. Riley has been Editor of the *Entomologist* since 1922, and was Joint Secretary of the Entomological Society from 1926 to 1930. He had four years' service in France, in the Royal Army Service Corps, and for the final year in the Royal West Surrey Regiment, rising to the rank of captain.

Mr. Wilfred Norman Edwards was educated at Cambridge and County School and at Christ's College, Cambridge, where he held a scholarship. In 1911 he gained a first class in Part I of the Natural Sciences Tripos, and in the following year a third class in Part II. He was appointed to an Assistantship in the Department of Geology in 1913, and was placed in charge of the collection of fossil plants. He is part author of the *Guide to Fossil Plants*, and has travelled widely in order to collect plants, both recent and fossil, for the Museum.

Mr. Walter Campbell Smith, who was educated at Solihull School and Corpus Christi College, Cambridge, obtained first-class honours in Part I of the Natural Sciences Tripos, Cambridge, in 1908, and in Part II in 1910, and was awarded the Wiltshire Prize for Geology and Mineralogy in 1908. He was appointed to an Assistantship in the Department of Mineralogy in 1910, and has been in charge of the collection of rocks. He held a non-residential fellowship at Corpus Christi College, Cambridge, from 1921 to 1924, and has represented Cambridge University on the Governing Body of the Royal Holloway College since 1922. He has been Secretary of the Geological Society of London since 1921, and General Secretary of the Mineralogical Society since 1927. He was Secretary to the Committee on British Petrographic Nomenclature in 1920, and is the author of many papers on petrological subjects. He has on many occasions been Examiner for the Natural Sciences Tripos, Cambridge. Mr. Campbell Smith had a distinguished career during the war, and rose in rank from lance-corporal in the Artists' Rifles at the outbreak to lieut.-colonel in command of the gas defences of an army corps. On demobilisation he rejoined the Artists' Rifles, and now holds the rank of major and is Second in Command. He was awarded the Military Cross and the Territorial Decoration.

Mr. Alfred James Wilmott was educated at Cambridge and County School and at St. John's College, Cambridge, of which he was a scholar. He obtained first-class honours in Part I of the Natural Sciences Tripos in 1908, and also in Part II in 1910. He was appointed to an Assistantship in the Department of Botany in 1911, and was placed in charge of the European and British Herbarium. He has given considerable attention to questions of nomenclature, and served on the Nomenclature Committee of the Imperial Botanical Conference in 1922 and the British Sub-Committee of the International Botanical Congress in 1930.

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Edward John Miers, who was an Assistant in the Department of Zoology from 1872 until his retirement owing to ill-health in 1885, died on October 15 last. He was the eldest brother of Sir Henry A. Miers, D.Sc., F.R.S., Trustee of the British Museum.

Natural History Magazine

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SOME INTERESTING MONKEYS LIVING IN THE MENAGERIE OF MR. W. L. ENGLISH, OF HASLINGTON, CREWE.

By J. G. Dollman, B.A., Assistant Keeper, Department of Zoology.

The accompanying photographs have been received from Mr. W. L. English, of Haslington, Crewe, and are of unusual interest as representing two monkeys rarely met with in a state of captivity.

The pigmy marmoset (*Cebuella pygmæa*) is the smallest member of the anthropoid group of Primates, being no larger than a small-sized rat; the length of the head and body being only about 6 inches and the tail measuring but little more. The generic term " *Cebuella* " was revived recently for this species, although it may be regarded as a close ally of the marmosets belonging to the genus *Hapale*. The two genera are, however, distinguished by the fact that there are no true ear-tufts in *Cebuella*, whereas in all the species of the genus *Hapale*, well-developed squirrel-like ear-tufts are present. The pigmy marmoset, which is the sole member of the genus, has somewhat the same ringed tail as is found in the genus *Hapale;* the general colour of the coat is a mixture of yellowish-tawny and grey, without the well-marked speckling found in *Hapale jacchus* and *penicillata*, the common marmosets.

The marmosets and tamarins are now considered to represent several distinct generic groups; some authors divide them into as many as seven genera, without taking into account the position of *Midas goeldii*, the curious primatian puzzle which a few authorities now accept as representing a distinct sub-family. All the marmosets and tamarins agree in having 32 teeth, their dentition being arranged according to the following dental formula :—$i2/2$, $c1/1$, $p3/3$, $m2/2$ * (the formula represents the number of different kinds of teeth in one side of the upper and lower jaws respectively, and should be multiplied by 2 to arrive at the total number of teeth). Here we have only two molars in each side of each jaw, not three as in the rest of the Primates, including the family Cebidæ. In the latter family, which contains all the other New World monkeys except possibly the form already referred to as *Midas goeldii*, there are 36 teeth, the dental formula being *i*2/2, *c*1/1, *p*3/3, *m*3/3. Thus we see that the members of the Hapalidæ agree with the Old World monkeys and man in the actual number of teeth, but they differ in that they possess one less molar and one more premolar in each side of each jaw; the dental formula of the Old World monkeys and man being *i*2/2, *c*1/1, *p*2/2, *m*3/3.

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* i = incisors, c = canines, p = premolars, m = molars.

FIG. 1.—PIGMY MARMOSET (*Cebuella pygmæa*).
About ½ natural size.

Some twenty-seven years ago the late Oldfield Thomas described *Midas goeldii* as a new species from the Amazons;

he then noticed that the hands and feet were unusually broad. The description was based on the skin only, the skull not being preserved, so that no account of the teeth was possible. Some years later a remarkable monkey was described by Dr. Ribiero, under the name of *Callimico snethlageri*; the description was based on a specimen living in the Para Zoological Gardens, and when it died it was sent over to Mr. Thomas for examination. It was then found to be identical with his *Midas goeldii*, and the skull of the animal proved to be of extraordinary interest in that it possessed the full dentition of the Cebidæ, that is, instead of there being only two molars in each side of each jaw there were three molar teeth, the dental formula being *i*2/2, *c*1/1, *p*3/3, *m*3/3, or 36 teeth in all.

One of the chief characteristics which distinguish a marmoset or tamarin from a member of the family Cebidæ is that the extremities of the front limbs are paws rather than hands, since the thumbs lie parallel to the other digits and are quite unopposable to them. Further, the digits are furnished with claws rather than nails. As the hands and feet of *Callimico goeldii* (as *Midas goeldii* is now called) are, in spite of their size, those of a true tamarin, exhibiting the "paw-like" characters noted above, it was clearly impossible to consider this monkey as an ordinary member of the family Cebidæ; and owing to the presence of the extra molar teeth it was a matter of some doubt as to whether it could be considered as belonging to the Hapalidæ. Accordingly Thomas extracted himself and *Callimico goeldii*

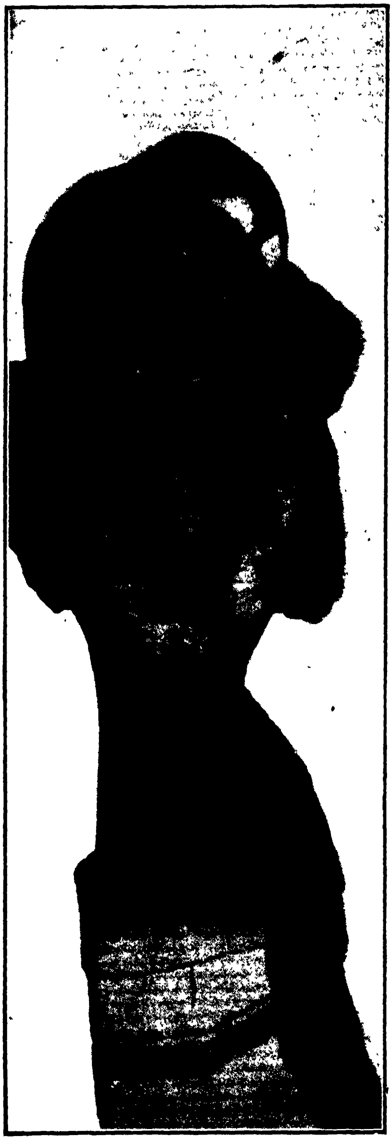


FIG. 2.—DOUROUCOULI MONKEY (*Aotus trivirgatus*).

from the difficulty, by founding a new sub-family, *Callimiconinæ*, which he described as a division of the family Cebidæ. This arrangement has been accepted by some authorities as a solution to the problem, but has been rejected by others as being an unnecessary and unmerited aggrandisement of *Callimico;* the latter they consider well-treated by inclusion in the Hapalidæ, regarding the extra tooth as not being of great importance. On the whole the most convenient arrangement, and in the writer's opinion the most satisfactory, is to regard *Callimico goeldii* as representing a distinct family group, for which the name Callimiconidæ is available.

The pigmy marmoset is an inhabitant of Brazil, the home of so many marmosets and monkeys. The marmosets and tamarins, as a group, are widely distributed over a great part of Central and South America, being most numerous in the great equatorial forest zone.

The second photograph is that of a douroucouli or night monkey, an animal rarely seen alive in this country, owing to its being extremely delicate.

The douroucoulis form a natural group or genus which is known by the name of *Aotus;* it was formerly called "*Nyctipithecus*," a name founded by Spix in 1823, but as it is antedated by the name *Aotus* (Humboldt, 1811), the latter title is now accepted for these monkeys.

The general appearance of these douroucoulis is distinctly lemurine, but it is an instance of convergence rather than of affinity. The old name for the genus, *Nyctipithecus*, is perhaps rather reminiscent of the generic title of the slow lorises, *Nycticebus;* but here again it is not the affinities of the two groups that have resulted in such similar names being given. The generic similarity of these two very different groups of Primates has developed independently in each genus owing to a similarity in environment and mode of life. Thus we find in both genera a rounded head and an owl-like face and very large eyes, and somewhat similar markings on the head. Further, both *Aotus* and *Nycticebus* have short woolly coats, short muzzles and small ears. In addition the skulls of *Aotus* and *Nycticebus* present some superficial resemblances; both have large orbits, or eye-sockets, to accommodate the large eyes, and the lower incisor teeth of *Aotus* are inclined forward rather in the same manner as is found in the lemurs, only to a less extent. The orbits of *Aotus* have a strong resemblance to the orbits of the tarsier in that they are closed in from the temporal region posteriorly, but the floor of the orbit is perforate; in *Nycticebus* the orbits communicate quite freely with the temporal regions, and it is, in fact, a typical lemur.

In common with all the other members of the family Cebidæ, the teeth in this genus number 36, there being three molars and three premolars in each side of each jaw. The lower incisors, as already noted, project forwards in a somewhat lemurine fashion, about as much as in *Tarsius* and, as in the latter genus and all the Pithecoidea, there is no gap between the upper incisors; this gap is always found in the true lemurs and lorises.

Most of the lemurine features of the genus *Aotus* are due to the fact that these monkeys, unlike the majority of monkeys, are strictly nocturnal in their habits, passing the day asleep in hollow trees and other hiding-places in the forests. At the same time it cannot be denied that the skull of *Aotus*, especially in the orbital region, presents more than one character in common with the tarsier, and considering the latter as a member of the "Grade" Haplorhini (Pocock), it might well be that *Aotus* can be considered a very primitive member of the Pithecoidea (Anthropoidea).

All the species of *Aotus* are entirely arboreal, wandering about the trees at night in search of the insects and fruit upon which they feed; during these nocturnal rambles they are reported to utter loud, cat-like calls, or sometimes noises like the half-suppressed barking of a dog.

The douroucoulis, together with two other genera of small South American monkeys, *Callicebus* (the titi monkeys) and *Saimiri* (squirrel monkeys) constitute the sub-family *Aotinæ* of the family Cebidæ; in all the members of this sub-family the tail is rather long and bushy, but is never prehensile. It is popularly and erroneously thought that prehensile tails are quite common amongst monkeys, but there are only four genera, all New World, in which this condition is found :—*Ateles* (spider monkeys), *Brachyteles* (woolly spider monkeys), *Lagothrix* (woolly monkeys) and *Alouatta* (howling monkeys). Thus we see that the Primates are not very much better off in this respect than are the Carnivora or Rodentia, and do not approach the state of affairs which exists among the Marsupials, where genus after genus of New and Old World forms has developed a prehensile tip to the tail. The prehensile area of the tails of these four genera of monkeys is, however, apparently very much more sensitive than that existing in other mammals, the tail tip being used more as a supplementary hand than as a mere hook for climbing purposes.

The squirrel monkeys and titi monkeys are, unlike the douroucoulis, diurnal in their habits and are more widely distributed; the former ranging all over Brazil, northwards to Costa Rica, and the latter being scattered about South and Central America from Panama southwards to the limits of the forest zone. The douroucoulis chiefly inhabit Central America and the northern part of South America, ranging as far north as Nicaragua, where the red-handed douroucouli occurs, and southwards into Brazil and the north-eastern part of the Argentine.

The white markings around the eyes and the dark head stripes, which are so characteristic of this genus, are seen to advantage in the present illustration; in some species these markings are very indistinct. A number of different forms have been described from time to time, but all are very much alike and the validity of some of the species is open to grave doubt; the chief characters which have been used in these descriptions are the development and colour of the head markings. Specimens from high mountain districts, such as *Aotus lanius* from the Tolima Mountains in Colombia, have considerably longer hair than is usually met with in the genus, and the head markings are accordingly very indistinct and blurred in effect; possibly these douroucoulis from such high altitudes may be entitled to subspecific rank. Probably the most distinct species are those from Nicaragua, the red-footed douroucouli (*Aotus rufipes*) and the species known as *Aotus trivirgatus*, a portrait of which is here reproduced; this latter form is an inhabitant of the Upper Amazons.

In connexion with what has been mentioned above concerning the affinities of *Aotus* and *Nycticebus*, it is perhaps interesting to note what was written about the genera by Bates, the author of " The Naturalist on the River Amazons " :—" I have mentioned the near relation of the Night-Apes to the Sai-miris (*Chrysothrix*), which are among the commonest of the ordinary Monkeys of the American forests. This near relationship is the more necessary to be borne in mind, as some Zoologists have drawn a comparison between them and the nocturnal Apes of the Lemur family, inhabiting Ceylon and Java, and it might be inferred that our American Ei-ás * were related more closely to these Old World forms than they are to the rest of the New World Monkeys. The large nocturnal eyes and short ears of the Eastern Lemurs are simply resemblances of analogy, and merely show that a few species, belonging to utterly dissimilar families, have been made similar by being adapted to similar modes of life."

* The douroucouli or " night-ape " of Bates, is called " Ei-á " by the Indians.

BRITISH MUSEUM EAST AFRICA EXPEDITION.

Account of the work done in 1930.

By F. W. H. Migeod, Leader.

The 1930 programme was, firstly, to resume excavating at Tendaguru for a couple of months; then, when the country inland had dried up and the grass could be burnt, to prospect via Liwale along the old Kilwa to Songea road to the last-named town, and thence to Lake Nyasa. In Nyasaland the dinosaur beds on the north-west shore were to be examined for the purpose of a closer study of the relationship of the Nyasaland dinosaurs to those of Tendaguru. The expedition, which left England in March, consisted besides myself of Mr. F. R. Parrington, B.A., of the Museum of Zoology at Cambridge.

Tendaguru, 50 miles north-west from Lindi, has been the headquarters of the expedition from the first; and the particular spot that I had selected the year before for this season's work was about 2½ miles west of north of Tendaguru Hill, and about 300 feet lower. It was near where in pre-War days the German expedition found their celebrated *Kentrurosaurus*, a spiked dinosaur allied to *Stegosaurus*. A piece of ground of about a quarter of a mile each way at the foot of the scarp was intensively examined, and in a short time M 23 became the designation of the site of a dinosaur of the *Brachiosaurus* type.

M 23; *General position.*

The position of M 23 was between two marine beds, the upper known as the *Trigonia smeei* zone, the lower about a hundred feet below it as the *Nerinea* zone. In altitude M 23 was considerably nearer the upper marine bed than the lower.

The rock on which lay the skeleton was a grey clay like the Kimmeridge and containing boulders of the same material. Above were alternating red and grey clays in thin layers. When viewed in a vertical wall these layers were in a waving line. A fault was visible. It crossed the ground a little below the ventral side of the skeleton.

Immediately below the upper marine bed was a thick bed of brown clay like that at the upper "Ng" digging, and also apparently without fossils. In one place on the east side was a little green clay with small chalk pockets in it. This was lying on the Kimmeridge.

It might be assumed that the carcase came to rest in the backwater of a river. Some of it sank into the mud, and the upper part was gradually and somewhat rapidly buried by currents of water bearing alternately red and grey clay. It might be assumed that the "Kimmeridge" clay had been partly exposed when this dinosaur of presumably Jurassic age

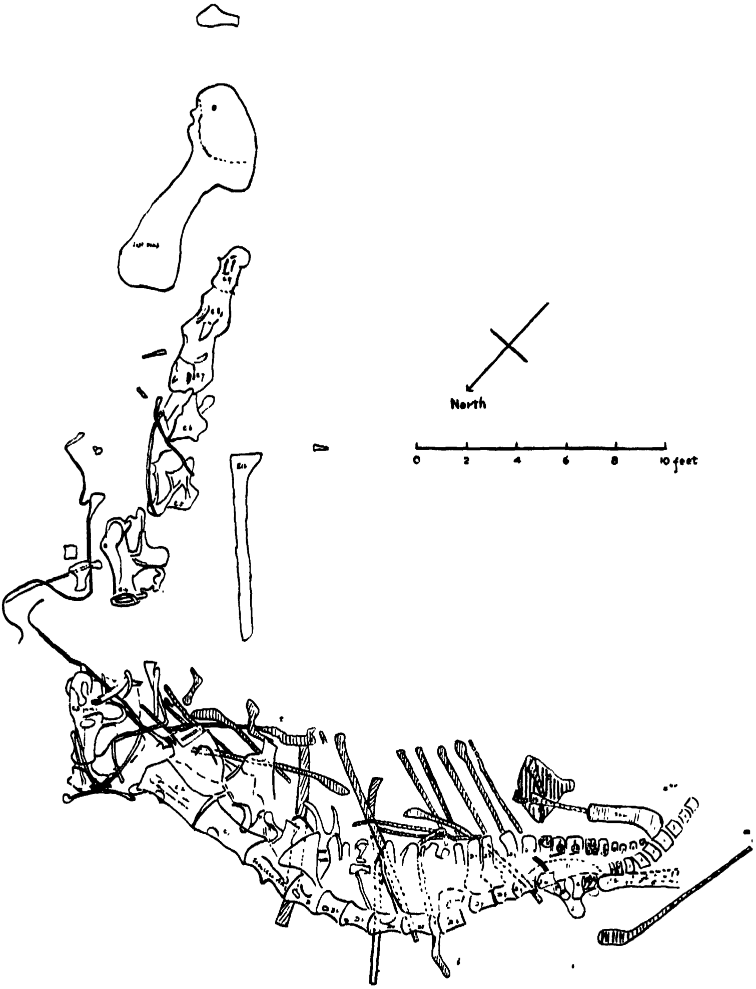


Fig. 1.—M 23, Ground Plan.

came to rest finally on it, and the surface was swept by currents of water bearing alternately scoured out Kimmeridge and the brown clay above it.

All parts of the skeleton were not equally well preserved. The roots of present-day trees had done some damage, principally at the sacral region. In one place there was a damp layer, so that while the highest and the lowest bones were hard, the intermediate section was powdery. Further, there was a strong and corroding impregnation of iron here and there, which had done considerable damage.

Marine beds.

A few notes must be made on the two marine beds mentioned. There is a low scarp not more than 50 feet high at its edge about a hundred yards from M 23. At its top is the end of the *Trigonia smeei* marine bed. The total thickness of the bed cannot be estimated from its terminal exposure, as it is already thinned down. Here its thickness is about 20 feet. Possibly its greatest thickness anywhere is about 50 feet. Among invertebrates found on or near its edge, where some cutting in was done, were *Trigonia smeei*, *Ostrea* sp., *Placunopsis* sp., *Lima* sp., *Lithophaga* sp., also some *Nautilus* and crinoid fragments, the last only found on the surface. The topmost part of this bed is sandstone. The bottom rests on the brown clay above mentioned at M 23. The height above sea-level of the edge of this bed is between 520 and 500 feet.

The lower marine bed, 400 to 300 feet, known as the *Nerinea* zone, can be viewed well less than a mile from the upper bed. This was about the distance at which I studied it, but there must be nearer exposures. There are several steep gullies where the whole of the marine bed can be viewed almost vertically for a height of ninety feet or so. The sequence of invertebrates found in the Kindope lower marine bed, the *Nerinea* zone of the Germans, is as follows* :—

Belemnopsis sp., scattered, from 370 ft. down.
Ostrea (*Lopha*) cf. *marshii*, J. de C. Sowerby, surface.
Nautilus sattleri, Krenkel, 350 ft.
Aulacosphinctoides sp., 340 feet.
Trigonia smeei, J. de C. Sowerby, 340 feet.
Gervillia cf. *aviculoides*, J. de C. Sowerby, about 340 feet.
Pteria tschingira (Krenkel) ,, ,, ,,
Syncyclonema cf. *solida* (Roemer) ,, ,, ,,
Lima cf. *monsbeliardensis*, Contejean ,, ,, ,,
Lima sp. of group of *L. duplicata*, Deshayes ,, ,, ,,
Protocardia sp. ,, ,, ,,
Pinna cf. *suprajurensis* d'Orbigny, 330 feet.
Nerinella credneri (Müller) 320 feet.
Pinna (*Trichites*) *g.-mülleri*, Krenkel, 300 feet.

Some fossil wood was found at 320 feet, and part of the pubis of a big dinosaur embedded in sandstone lay low down a gully, but it was not possible to find its original position.

* The identification of the Ammonites is by Dr. L. F. Spath, of the others by Mr. L. R. Cox.

In M 23 no derived invertebrates were found, nor any in position.

Before giving some notes on the measurements of the bones, a description must be given of the general appearance of this dinosaur, together with a reproduction of the ground plan. It may be assumed that it was giraffe-like in shape, but of course on a far bigger scale, and its hide would have been like a lizard's. Of this no impress was found in the clay. Presumably the creature was cold-blooded, though whether the dinosaurs were actually so is a point that has been debated. At the shoulder it must have stood 18 feet in height with its head on a long flexible neck towering 25 feet higher. At its hind-quarters it was probably not more than 12 feet high.

The neck was deep rather than broad, and the vertebræ found give a 20-foot length. The lower ones, however, would have been in a sloping rather than an erect position. To this the four, or perhaps five missing vertebræ near the head would have added well over five feet more.

Of the skull no fragments have so far been identified, and this, the most interesting part of the body, as is so commonly the case with the dinosaurs, is lost. A large tooth was, however, found, measuring 6½ inches in length with a maximum circumference of 5¾ inches, which would indicate that the head was large. This tooth, which is pointed, has a slightly serrated inner edge. Two other teeth, small ones, were also found in different places. Their dissimilarity in size would not be unusual if this dinosaur were a theropod, a flesh-eater, for this type had teeth of very varying sizes; but it is rather disconcerting in this case, the presumption being that the dinosaur was a sauropod, a vegetation-eater. It is therefore open to suspicion that the big tooth may be an intrusion.

The length of the back including the sacral region was about 15 feet. The eight or nine caudal vertebræ cover about 6 feet. From their size it may be assumed that the length of the tail cannot have been less than 20 feet, and much more if a whiplash end existed, a point that is examined later.

This specimen, therefore, from nose to tip of tail may well have been over 70 feet in length.

The cervical vertebræ.

Comparing the cervical vertebræ of M 23 with those of the well-known skeleton of *Diplodocus*, the vertebræ of the latter seem quite dwarfed.

The first cervical (C 1) is 33 inches long, compared with about two feet in *Diplodocus*, and on it and running its full length, and connecting with preceding and succeeding vertebræ, is a great superstructure. This, built up of "girders," plates and "buttresses," a construction found, of course, in the other cervicals as well, is of great intricacy, and though the whole as a living structure would have been of great strength, each part is delicate, and all the more so in its present-day condition. This superstructure was 44 inches high in C 1. This vertebra was firmly adhering to the succeeding "shoulder" vertebra, and to C 2, and could not be separated without cutting.

The neck had a break at C 2, the main part of the vertebra being left adhering to C 1, but drooping considerably, and the smaller part was fixed to C 3, which was twisted round to the right and depressed into a hole. The break was sharp and the gap left measured about a foot. C 3 was turned almost at a right angle to the main line of the backbone, and separated by a gap from the next anterior vertebra. This was the longest cervical, measuring 41 inches. Its great superstructure, in which appeared large sheets of the thinnest bone, was of a crumbly nature and could only be got out in pieces. The more solid portions also had to be plastered separately. Several processes on the under side as it lay on the ground were very friable.

After C 3 the vertebræ rapidly dwindle in size. C 4, 5, and 6 were separated by short intervals, but 7, 8, and 9 were adhering to one another. All of these were in very good condition, and were plastered separately without cutting to reduce size. C 4 was 39 inches by 23 high, and about a foot in thickness. The interior of the centra, as with the dorsal centra, are of a light cellular nature, the hollows being filled with the varying clays of the upper stratum which permeated into it.

Numerous short neck ribs were lying near the lower cervicals. In addition was the interesting preservation of a number of tendons of great length. One of them extending backwards from C 5 measures 97½ inches, and is completely ossified and fossilized. It is about an eighth of an inch in diameter throughout its entire length, but has an elongated triangular head 10 inches long and with a terminal width of 6 inches.

Dorsal vertebræ.

It was difficult to number the dorsal vertebræ, Nos. 1 to 11 from the sacrum, for the reason that there was considerable damage in that region, and it was impossible at an early stage in the excavation to decide which was the first dorsal vertebra from the tail end. In the circumstances the "shoulder" vertebra was taken as the zero, the next to it on either side being C 1 or D 1. In this skeleton the "shoulder" vertebra was readily distinguishable. Its length was 24 inches, and so shorter than the next cervicals, but very much longer than the first true dorsal.

Owing to this reptile's enormous neck and shoulder development, and to its tapering away behind like a giraffe, the dorsal vertebræ are remarkably small as regards their centra for such a big dinosaur. Dinosaurs of the *Brontosaurus* type, on the contrary, have dorsal vertebræ with very large centra. What, however, is lacking in the centra is made up for as regards the more anterior vertebræ by the neural arch and spines.

The length of some of the dorsals is as follows:—Shoulder 23 inches; D 1, 14 inches; D 2, 11 inches; D 3, 10½ inches; D 5, 11 inches; D 10, 9 inches; the others being about the same. The evolution of the ventral surface groove running through all the cervicals is thus shown in the dorsals. On D 4 there is no indication of it. On the next one, D 3, there are signs of flattening on the lower face of the centrum. D 2 has a distinct hollow at the anterior end. D 1 has a bigger groove at the anterior end. In the shoulder vertebra the groove runs the full length of the lower surface, and in cervical 1 the deep trough is fully developed. There is a solid process or butt at the anterior end of the centrum. This is its development as observed on the left side: D 4 nil; D 3 slight; D 2 larger; D 1 larger still; shoulder vertebra, very large and on the edge of the groove. In C 1 it was flattened out and nearly gone; and in C 2 transformed.

All the dorsal centra, which are opisthocœlous, were with one exception adhering very firmly to each other, especially the more anterior ones, so that some of them could only be separated by cutting, the rather elongated convex fore-end holding firmly into the posterior hollow of the preceding vertebra. The exception was a break between D 6 and D 7. The centrum of D 6 was in two parts, and whether there was a centrum that had slipped down here I was unable to determine while the vertebral column was *in situ*, when it was necessary for reference purposes that all the vertebræ should be numbered. After extracting D 7, however, together with D 8 (which were plastered together so that there might be no disturbance of the interlocking neural arches) there was found below D 6 part of a centrum not in the line of the other centra, but pushed up under the neural arches. It lay with its concave end correctly turned posteriorly. In all probability it belongs to the skeleton and will thus add one more vertebra to the back. The additional number of neural spines rather supports this view, as there are more than can normally be assigned to their proper centra.

On coming to the sacrum, D 11 is doubtfully claimed as a dorsal vertebra, when perhaps it is a sacral vertebra. The sacral region was badly crushed, and a re-examination of the material is necessary.

The centra, though solid to outward appearance, were of very thin cellular structure inside, and filled with the grey and red clays in which the greater part of the vertebral column lay.

With regard to the neural spines: the anterior dorsal vertebræ apparently had their neural spines in two parts, which led me at first to the opinion that this dinosaur was a *Dicraeosaurus.* This view proved on further excavation to be untenable, and indeed the bifurcate spines were similar to neither species of *Dicraeosaurus* found at Tendaguru by the Germans. Owing to the skeleton being on its right side the spines were pressed together, and only in the case of one dorsal, No. 4, and doubtfully D 3, could it be seen, as they lay in the ground, that the bifurcate spines stood in the living animal side by side. D 5, for instance, had two knob-ended spines lying side by side and in the fore-and-aft line. These might have been displaced. Ends of all the anterior spines were knob-like rather than of an oval section, while those from about D 10, the sacral ones, and those of the tail were as usual flattened. D 10 first indicated a distinctly circular section. There are more of these flattened spines than would furnish one for each centrum, and their allocation requires further study of the material. Already in D 10 the length of the neural spine was considerable. From Nos. 5 to 1 all the neural spines and processes are inclined forward, indicating a rise of the anterior part of the body. Of the two neural spines of D 4, which lay in the ground one over the other, and so were in their correct position, the upper one, *i.e.* the left, connected with D 5 and the under one with D 3.

In D 4 to D 1 a new development occurs. That is, the spines have great " wings " consisting of thin bone with thicker edges, and running to some two feet in diameter. They were in position on the lower side of the vertebra, but I was unable to decide whether there were two, the upper one having broken away, or whether the wing was a single one and standing somewhat like a sail. Why I was doubtful was because there lay partly on D 1 and partly on the shoulder vertebra a triangular flat bone of much the same shape, and I could not determine whether it was a broken-down wing, or whether it was the head of one of the larger ribs. I was indisposed to disturb it, and it was plastered in position.

The following are the lengths of some of the spines of the dorsal vertebræ measured from the middle of the centrum on the ventral side. D 3, 39 inches; D 5, 38 inches; D 9, 34 inches; shoulder vertebra, 39 inches.

Tail.

Only a part of the tail was recovered. This was the proximal end, with one or two other stray vertebræ. There were eight caudal vertebræ in their proper position. They were amphicœlous, but inclining to have deeper cavities on the anterior surface. The upper, that is, the left-side surfaces were much worn down, especially as they neared the sacrum, where only about half of each vertebra was left intact. The neural spines were rectangular and generally good. It was difficult to decide whether the nearest vertebra was caudal or sacral, but it was probably the former, and so would raise the number of caudals in line to nine.

In addition to the part of the tail lying in line, a small vertebra 2 to 3 inches long was found near the humeri, and later still another only 13/16ths of an inch long in the tail region, but about 8 feet down. This last, if belonging to the same skeleton, and there is no great reason to presume otherwise in view of the depth at which the ribs and other bones were found, might indicate a whiplash end to the tail, a feature that would add very materially to the total length of the skeleton.

Another equally small vertebra was found above the general level of the skeleton just beyond the humeri. Its association with the skeleton is therefore doubtful.

Limb bones and shoulder girdle.

Of the fore limbs there were found the scapula lying in the line of the neck and at its extreme end the two humeri. Of the lower limbs only the doubtful head of a radius was found.

The scapula was the left one, and though of great size was a very thin bone. The coracoid was completely fused with it. The total length was 87 inches measured on the curve; the arm and shaft were 26 inches across, and the end which was splayed was 27 inches across. Of the right scapula there was no trace.

The two humeri lay about 9 feet distant from their normal position. They measured 57½ inches long and 20 inches wide, and whilst one was sound, half of the other powdered away. These two were on the same level as the very highest part of the backbone. Though somewhat small for such a skeleton, from their position it was not possible seriously to doubt their association, until, just before closing down finally at the end of the season, another scapula was found close by and at a slightly higher level still. This measured 48 inches by 18 inches wide, but the edges and ends were worn off, and even allowing for this loss it cannot be regarded as the pair of the other scapula. Its proximity, therefore, to the humeri might almost seem to throw doubt on the two latter, a point that can only be settled when the bones are prepared and the articulations studied. In addition, it is possible that some uncertain fragments may be part of a sternum.

FIG. 2.—M 23, BIG SCAPULA.

Of the hind limbs, one femur was found, measuring about 4 feet. Being in bad condition its exact length could not be ascertained. It lay some 3 feet below the pelvis. Of the other femur only parts were recovered. The tibiæ and fibulæ were not recognizable, nor was any part of the feet found, except a calcaneum.

Sacral region and pelvic girdle.

This part of the body, which was the first discovered, lay nearer the surface than any other part of the vertebral column, and had therefore suffered most damage.

The only bone recognizable in the first instance was an ischium of large size, but broken into segments of an inch or two each way. The joining up of these pieces occupied a considerable time. Only parts of a pubis were found: they were the ends, and were 10 and 8½ inches wide respectively. Of the other ischium and pubis only uncertain fragments were found.

After the sacral vertebræ had been extracted the right ilium was found lying underneath and in excellent condition. It measured 38½ by 31 inches, and was distinctly the type of ilium of a Sauropod, more particularly of *Apatosaurus* (or *Brontosaurus*). Before this ilium was uncovered a flat bone had been found lying just below and in close proximity to the sacral area. It measured 26½ by 25 inches before plastering, and was assumed to be one of the ilia. The discovery later of the real ilium made a revision of the identification of the other desirable, but it had already been plastered and packed.

The sacral vertebræ seem to be five in number, but there is a sixth of doubtful classification. The lower-lying processes were more or less in position and in good condition, but the left-side ones were fragmentary or lost.

Ribs.

The excavation had been carried on for some time and but few ribs were noticeable. This was puzzling, as pieces of rib are generally common in all excavations. The skeleton being on its right side, the dispersal of the left ones was not unnatural, and some were recovered later. Why none of the right ribs was found at first was because they were deep in the ground. As soon as one of them was discovered all the rest were found close by and lying more or less in their correct positions, the whole flank of the reptile having evidently come away in one piece. The heads of the ribs became detached from the vertebræ, but apart from that there was no shifting of position, and the side of the dinosaur complete, held together by the then undecayed skin, was pressed down in the mud by the weight of the body. The depth in the mud of the foremost big rib was 4 feet, and others averaged 3½ feet below the spinal column. This gives some clue to the thickness of the body, making it between 7 and 8 feet broad at the breast. One of the heaviest ribs measured 82 inches, but a thinner one was as much as 92½ inches long. The former had a slightly triangular section, and the majority of the thinner ribs an oval section, but one big rib under the fore-part was very flat and was about 6 inches wide.

It was scarcely to be expected that all parts of the skeleton should be equally well preserved. The roots of trees do most damage. In one place there was a damp layer, so that whilst the uppermost and the lowest bones were hard, the intermediary bones were powdery. Further, there was a strong and corroding impregnation of iron here and there, which had done considerable damage. One region in particular I should like to have found perfect was the base of the spine. Here is lodged the larger of the two brains which most dinosaurs possessed. One can speculate freely on the relative functions of these two masses of nervous matter. If the head brain, which may be less than a quarter of the size of the posterior brain, merely served for vision, hearing and scent, etc., one can imagine it, on coming to something new, telephoning to the base to ask for instructions, failure immediately to respond being likely to cause disaster. Still, speculation and imagination have many pitfalls. When one part of mankind cannot grasp the mentality of another part, to grasp that of a dinosaur sixty million years ago is not less difficult.

TENDAGURU.

Feet above sea level. Vertical plan of diggings, etc.

800 (about). Top Tendaguru Hill. Marine Bed, *Trigonia schwarzi* zone.
747. Tendaguru House datum point. (Former estimate 827 ft., less 80 ft. correction, = 747.)
700. —
675. M 4, M 8, M 18 (about).
670 to 665. Ng. marine bed. Belemnites.
665. M 3 (sand), M 3*a* (sand). Bone-store.
660. M 7 (plants).
645. Ng. upper.
635. M 1 (laminated grey grit on sand).
630. M 9, M 11.
620. M 6, M 21 (about). Both containing derived belemnites. Ng. lower.
610. M 10.
605. M 19.
600.
580. M 20.

? Same marine bed. Existence only traceable between Ng. and Kindope by occasional derived invertebrates. Dip about 1 in 140.

565. M 2 (sand, sandstone).
555. M 5 (contorted coloured clays).
550. Kingutinguti waterhole in ravine.
520. Upper Kindope marine bed at edge of scarp (*Trigonia smeei* zone). Crinoids, *Trigonia*, *Nautilus*.
500. Bottom of Upper Kindope marine bed. Brown clay begins.
472. M 23. On " Kimmeridge " clay. Above, alternate thin streaks red and grey clay. No invertebrates.
400. Sandstone. Top of lower Kindope marine bed (*Nerinea* zone). Zone contains *Trigonia, Belemnites, Ammonites, Nerinella,* Fossil wood, etc.
300. Bottom valley, and about bottom of marine bed.
0. Sea level.

Notes.—(1) Heights assessed by aneroid.
Estimates given in earlier printed papers now revised.
(2) The relative position of M 4 and M 8, etc. in regard to Ng. Marine Bed requires accurate levelling.
(3) Invertebrates mentioned are this year's finds.

Towards the end of August work had to cease at Tendaguru to enable the Nyasaland part of the programme to be carried out. The bones still unremoved were therefore covered up, and at the end of the month the expedition, taking several of its old trained natives, left Lindi for Songea in motor lorries, the distance of 380 miles taking four days. The original plan had been to travel on foot direct from Tendaguru to Songea in order to prospect for more bones on the way, but this part had to be cut out. The only part of the journey, therefore, on which carriers were required for the baggage was between Songea and Manda on Lake Nyasa, a matter of about seven days. On this section I broke the journey a few days at Likuyu to make a botanical collection, and at Munya maji, two marches on, a patch of Karroo formation was passed over. A small surface collection of reptilian bones was made here. They had become a hard chert, and lay in a soft sort of marl. On the 10th of September the Lake was crossed to Ngara in the Nyasaland Government steamer "Guendolen."

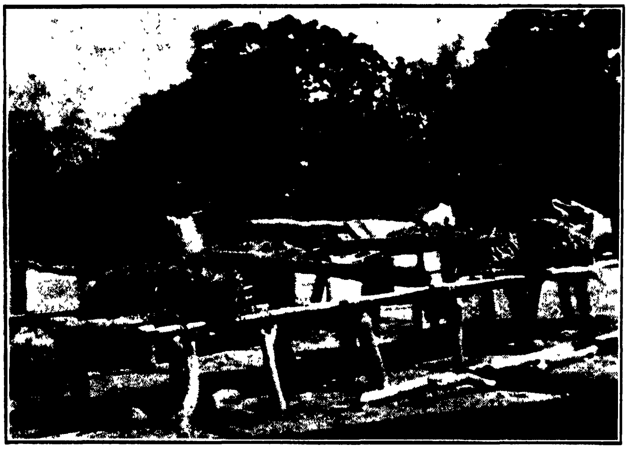


Fig. 3.—Big Bones Packed ready for Transport from Tendaguru.

The Nyasaland Government had very kindly made all necessary arrangements in advance, so that no time was lost in beginning work. Mr. W. A. Maxwell, a planter living at Nyungwe, a few miles from where it was proposed to work, very greatly assisted by inviting us to make his house our headquarters whilst in the neighbourhood, which welcome assistance, measured in terms of time, added quite a week to our stay in the country. Dr. F. Dixey, O.B.E., Director of Geological Survey, also met us, and his advice was of the greatest value, as he had earlier prospected all this part of the country.

The north-west shore of Lake Nyasa was first examined between 1906 and 1909 by Dr. A. R. Andrew and Mr. T. E. G. Bailey, and since 1924 has been very thoroughly gone over again by Dr. Dixey. As a preliminary I give a table of the rocks and their appearance based on Dr. Dixey's reports.

North-west shore of Lake Nyasa.

The Tertiary and post-Tertiary Lacustrine Sediments.

	Beds.	Maximum observed thickness.	Appearance.
Recent.	6. Recent deposits.		
Pleistocene.	5. Dwangwa Gravels.		
	4. Songwe Volcanic Rocks.	250 ft.	
	3. Chitimwe Beds.	270 ft.	Red conglomerates with red gravels above.
Pliocene.	2. Chiwondo Beds.	200 ft.	Unconsolidated calcareous marls, silt and sands associated with bands of shelly limestone. Pale grey, greenish-grey, pale buff, more rarely light red.
Pre-Pliocene, Miocene or earlier.	1. Sungwa Beds.	160 ft.	Buff-coloured grits and sandstones with locally large pebbles and small concretions.
Lower Cretaceous to Jurassic.	Dinosaur Beds.	?1200 ft.	Friable sandstones, sandy marls and clays. In lower part, red, mauve and purple tints; in upper, red marls alternate with white sandstones. Bones rare in lower part. Dip 10 to 30 deg. N.E.
Triassic.	Karroo Beds.	—	(Deposit at Chiweta a very hard shale tilted northerly.)
? Pre-Cambrian.	Crystalline Rocks.	—	Include Schists and Gneisses with intrusions of Syenite and related rocks.

It was the dinosaur beds with which the expedition was principally concerned. They lie within the Nyasan Rift Valley at an average distance of about eight miles from the north-west shore of Lake Nyasa. They extend for about 78 miles, for the greater part of which they rest on crystalline rocks. In one or two places Karroo beds are recognizable below them.

The upper beds are characterized by strong current bedding and contemporaneous erosion and marked alternation of red and white colouring. The red bands are usually of a marly, clayey or shaly nature, whereas the white are sandy, gritty and occasionally pebbly. In general they are soft, friable and easily weathered.

This occurrence of dinosaur bones in positions indicating current bedding is also common to Tendaguru.

In the lower beds, according to Dixey, remains are rare, a point I was not able to go into, as, being desirous of finding bones, I examined first the ground they were most likely to occur in.

Although the dinosaur beds extend a considerable distance north and south in a long thin line, it was only in the neighbourhood of Mwaka Syunguti that excavation was done this year, as this was proved bone-bearing ground.

This name is given to the upper part of a valley that runs down to Nyungwe, which is six miles from Ngara, a calling-place for steamers on the Lake. It is so called from a chief who has two villages some four or five miles up the valley. The river down it runs all the year through. Above Mwaka Syunguti village the valley is very eroded, with precipitous hills a hundred or more feet high, which are strewn with large pebbles, chiefly of quartz. The width of the valley might be about two miles at the upper Mwaka Syunguti village, which is rather over a mile from the first village of that name, and digging was begun a mile up beyond village No. 2.

The east and west sides of the valley are bounded by crystalline hills. The eastern ridge shuts off the Lake. The western ones are the foot-hills of the Nyika plateau.

The dinosaur beds occupy the middle of the valley. On these at the sides are the Chiwondo beds (Pliocene). A good section of these beds may be followed for several miles along the bold scarp following the eastern side of the valley. They are of a variable thickness with a maximum of about 100 feet as observed by Dr. Dixey. On the Chiwondo beds are the Chitimwe beds (Pleistocene) which form a conspicuous battlemented capping to the east scarp. The thickness of the Chitimwe bed is according to Dixey about 20 feet for conglomerates, on which lie to a depth of 60 feet red gravels.

There would seem to be Pliocene beds resting immediately on dinosaur beds in this valley. It is, however, the Sungwa beds which in other places are found to intervene, and further examination of this valley may reveal their existence here too. The first dinosaur bones discovered in Nyasaland were collected by Mr. E. C. Holt in 1924 according to Dixey.

The first few days in the valley were given to prospecting from the camp which was established at village No. 2. It was difficult owing to the steepness of the hillsides, the valley being deeply intersected with gullies. Very few of the surface bones found were worth removing. Subsequently digging was carried on in four localities.

Site A was about a mile straight up the valley from the camp.

It was on a hill-top, and excavation was easy, as it was only necessary to throw the earth down the hillside. Here a number of bones were found belonging to at least two Sauropods, most being in good condition. To give some idea of the size :—one scapula was 45 by 17 inches; (?) tibia 27 by 8; a pair of scapulæ 31½; humerus 32; femur 46; (?) radius 28½; two thin plates, (?) sternal, 17 by 11 and 15½ by 11½. There were also incomplete ribs, a pubis and ischium, and some vertebræ, mostly centra only. There were also a humerus of unusual shape and other uncertain bones, among which were what might be external spines. A part of a large bone, perhaps a femur, lying somewhat apart, was found to be completely impregnated with a cobalt blue coloration.

Site B. This was about a mile farther up the valley. Not many bones were found here and they were scattered as much as ten yards apart. They were on the surface or immediately below it. Digging did not reveal other bones in proximity to the ones found.

The finds were a humerus 32 inches long, the centra of two caudal vertebræ, and a femur 46 inches. In addition were some small fragments of bones about a millimetre in diameter; a very small vertebra; two shells (*Unio, sp.*); a part of a big bone in three pieces completely calcified; and specimens were also taken of a rippled brown clay.

Site C. This site lay to the right going up the valley, and about the same distance from the camp as A. Some of the bones from here were distinctly puzzling.

Among the finds were a femur 34½ inches; tibia 18½; (?) metatarsal 7½; several centra, a sacral vertebra; and a vertebra with a neural spine which was cup-like and which must be that of a dinosaur, if dinosaur it be, of unusual type.

Site D was another hill peak only about a hundred yards from A. It produced a group of bones all belonging to a single small Sauropod. On the surface close by were found amongst the quartz gravel several pieces of fossil wood, which were probably of derived origin, the same as the gravel.

The bones included both humeri 27 inches; ulna; femur 34 inches; both radii; both scapulæ; ribs; ilium, very curved; pubis; (?) coracoid; and numerous vertebræ, some with spines complete. Their preservation was good.

Bones were also reported from lower down the valley below the two Mwaka Syunguti villages, but after examining them I did not consider it worth while digging there in view of the shortness of the time available. One enterprising native, on finding old bones to be sought after, made a collection of all he could find on his farm, and put them in his house, and then offered to sell them to me. He received sixpence for his report, but a sale was not effected.

Uraha is a small flat-topped and wooded hill seen to the south over the flats from Nyungwe house. It is about six miles distant by road. It rises 250 feet above the Recent alluvial plain, and constitutes one of the best exposures, according to Dixey, of the Chiwondo beds. The Chitimwe beds topping these are 15 feet in thickness according to Dixey.

A small village lies about half a mile from the rise of the hill, and here a camp was made, a stream of water being close by.

No excavation was done on the top, but from the slope some pieces of a *Mastodon* jaw were recovered, together with several elephantine and other teeth, a small (?) metacarpal, small astragalus, etc., also a lamellibranch shell. An extensive examination of this hill would be of interest.

After Uraha and Mwaka Syunguti had been done, the expedition moved south beyond Florence Bay to Chiweta.

The small area of Karroo formation to which this name is given is comprised within about one square mile, lying between the southern spurs of Mt. Waller and the Lake. Mt. Waller is a conspicuous eminence with well-defined stratification at the top, visible from a great distance. The deposit is bounded on the south by the rocky and swift Rumpi river, while on the north edge of its valley and at the base of the 250 feet high ridge that separates it from the Karroo area are hot sulphur springs. Up the Zindiri valley, the next gorge to the south is a coal deposit about 700 feet above the Lake.

The Chiweta beds dip north easterly, so that the oldest reptilian remains are exposed on the S.W. side at a height of over 200 feet, and here some were found under a rocky cap. The ground is mostly a hard shale, which is difficult to break up.

Surface finds were made over the whole of the ground, and in the fortnight that was given to this locality probably most of the exposed fragments were examined, and not much is left worth removing. Owing to the hardness of the ground, excavation is a matter of the greatest difficulty. *Dicynodon* bones were the most common, but there are others which have still to be identified.

The Nyasaland part of the programme was now completed, and on the 5th November I recrossed the Lake to Manda on my return journey to Tendaguru, Mr. Parrington leaving the expedition in order to return home via South Africa. I extracted the bones I had left behind, and though digging was carried on for five weeks more, not much of any value was found, and the missing bones I had hoped to find were still elusive. They had probably drifted away when the carcase of M 23 rested finally on its right side in a shallow backwater.

Now Tendaguru is abandoned. I disposed of the equipment in accordance with instructions and left for England in January.

EARTHQUAKES IN BRITAIN.

By W. E. Swinton, B.Sc., Ph.D., Assistant Keeper, Department of Geology.

At 1.26 a.m., Summer Time, on Sunday, June 7, 1931, Great Britain was visited by " the worst earthquake ever known in England." However true this description may be, the event was seized upon with enthusiasm by certain sections of the Sunday Press, and we were informed that thousands of people rushed from their homes or telephoned to the police or the exchanges. What solace they thus obtained was not divulged by the more sober week-day publications. Days after the first excitement had subsided, energetic persons were still describing their experiences in letters to editors. Some had the unhappiness of observing a sort of wave traversing the floor of their rooms, others described the feeling as akin to sailing in a rough sea. Fortunately the majority of the public, less sensitive perhaps or maybe better sailors, slept peacefully without any such maritime discomforts.

Against the over-sensitive class of observers may be placed that section which treated the event with undisguised levity. Of such is a lady journalist who remarks delightfully: " When I felt my bed shake under me I supposed it was merely the man-under-the-bed, for whom for many years I had neglected to look, and who now, waxed bold from my long tolerance, was heaving under me."

The sensational view of the earthquake was long ago belaboured by Dr. Johnson: " Sir," said he, " it will be much exaggerated in popular talk. People do not mean to lie, but taking no pains to be exact they give you very false accounts. If anything rocks at all, they say it rocks like a cradle."

The views of those like the lady journalist only show what a charming field of literary speculation the phenomenon provides, a field attractive to explore, but, alas, not dull enough for a semi-scientific article!

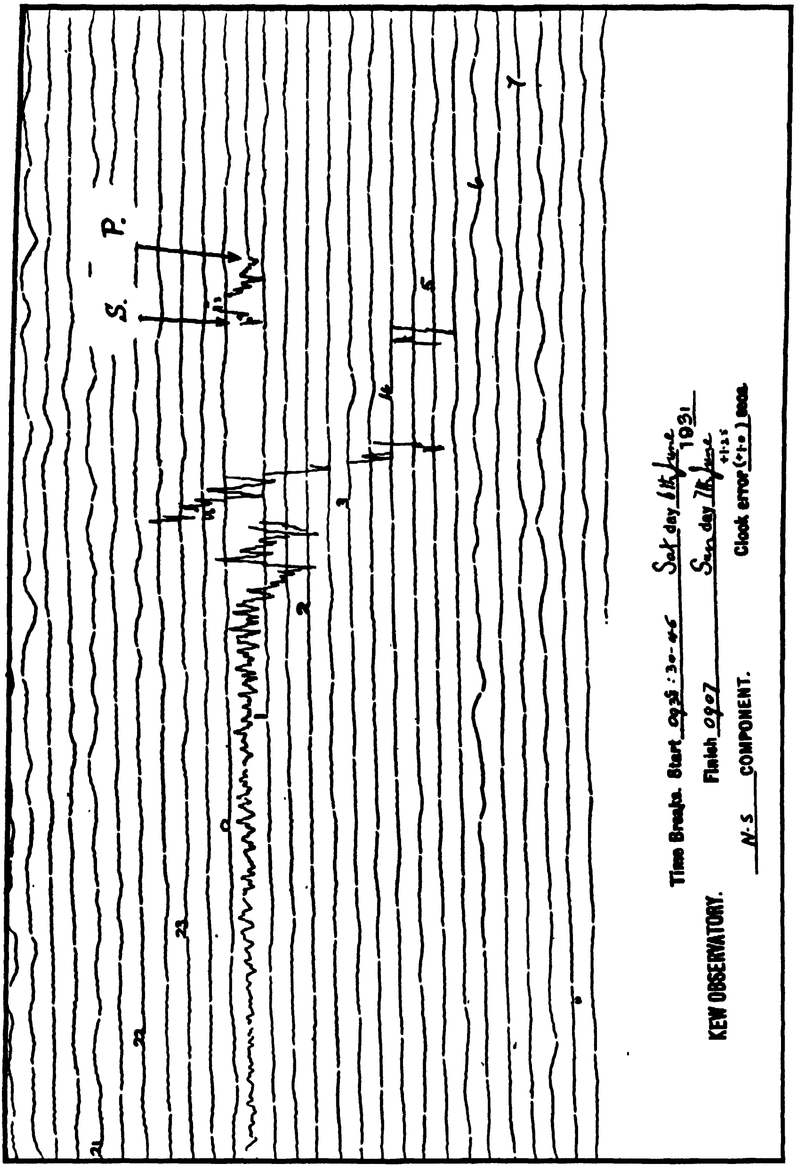


FIG. 1. *By permission of the Director of the Meteorological Office.*

The record of the June Earthquake as registered at Kew. Three components in all are registered and the difference in their arrival times gives an indication of the distance of the focus.

Apart from these two schools of thought there remains then only the great section of the populace who either overlooked it in sleep, or took it all in the natural current of events. For them, however, the bare facts exist. The tremor was actually felt over a wide area: in England, southern Scotland, parts of France, Belgium, Holland, and Norway. It was sufficiently strong to throw at least the Kew seismograph out of action for a fraction of a second, and was distinctly perceptible to human beings. This demonstration that even in our own familiar country-side terra firma is not necessarily firm, following upon the appalling disaster in New Zealand, and the rumours and records of earthquakes elsewhere, must have caused many to inquire what an earthquake is and how it is produced.

Earth tremors are familiar enough to us all in every-day life. Heavy automobiles, railway trains, gun-fire, and explosions all produce some earth movement sufficient to cause houses and household articles to move perceptibly or audibly. These are truly earth tremors, but not in the strict sense earthquakes. That term is confined to movements of the earth's crust, whether perceptible to man or not, which are the result of purely geological processes.

It may be said then that earthquakes arise from one of three main causes: (*a*) Volcanic activity; (*b*) The collapse of subterranean cavities; (*c*) Fault movements.

Volcanic Activity.

It was formerly held that all earthquakes were the result of volcanic action. The outpouring of lava produced subterranean weakness and surface pressure which caused crustal movement or collapse over a more or less large area. The occurrence of both volcanicity and earthquakes in similar zones, particularly around the Mediterranean and Pacific shores, lent strong support to this theory. Actually we know now that these two phenomena are not necessarily connected, and whereas it may be true to say that volcanic areas are always earthquake areas, the reverse is certainly not correct. The most severe earthquakes have not been associated with volcanic outbursts, and even the greatest of the latter has produced effects, though lasting and widespread, less disastrous to human life. It is hardly necessary to say that no British earthquake in human times has been associated with volcanoes.

Subterranean Collapses.

The solvent effect of water in limestone districts is common knowledge and the famous caverns of Cheddar and Derbyshire are well known. It will be realized, therefore, that the continued action of water over long periods must produce great caverns underground, which are liable to collapse. Swallow-holes are formed in this manner, and their formation and the falling in of limestone caverns will necessarily cause perceptible noise and movement over a limited area of the surrounding country. Such movement is dangerous to property and life immediately adjacent to the occurrence; but, fortunately, even the post-war builder usually avoids such sites, and seldom is damage through this agency reported in England.

Fault Movements.

The most frequent cause of earthquakes is movement along a line of geological weakness. To understand this occurrence it will be necessary to explain the nature and origin of faults.

The idea of the earth as an orange-shaped body is common, and like an orange the central mass tends to shrink while the outer skin or crust crumples as it contracts. The earth's crust is similarly crumpled, with the result that considerable lateral pressures are instigated. The effect of this is folding of the strata, sometimes of small extent, but often widespread and ending in mountain building. The minor folds are frequently seen in railway cuttings and in cliffs. The degree of elasticity in rocks is not high, however, and there is a point beyond which folding is no longer possible and the strata break along a definite plane. This plane is commonly called a fault when there is relative displacement of the two sides. This may be considerable, with the result that the rocks on either side of it may be of very different age. It will be realized that a fault is therefore a line of geological weakness with displacement, along which minor settlements of the strata are liable to occur from time to time. It also follows that those fault lines which are of ancient date are more stable than those of more recent formation, since the rocks have had longer time to settle. The majority of earthquakes, then, are attributable to settlement along faults, but it should be borne in mind that even a serious earthquake does not demand any great displacement. The recent English earthquake was no doubt due to a movement of only a small fraction of an inch.

One important factor affecting the destructiveness of earth movements is the nature of the overlying material. Where a town is built upon solid rock the shock is likely to be more directly transmitted, for purely physical reasons, than if a protective, " deadening " layer of clay intervened. This is a general rule, although there have been notable exceptions, particularly at Port Royal, Jamaica, where during a shock in

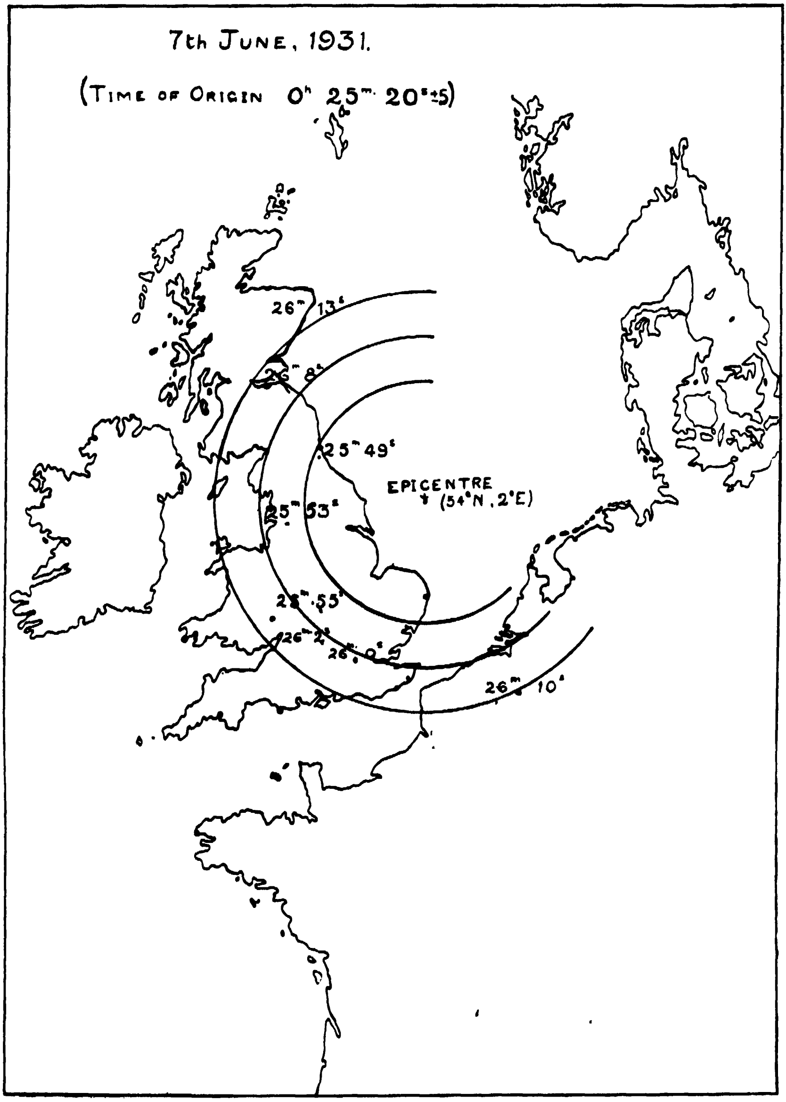
1692 houses built on limestone remained standing while those on the sandy area were devastated. The same occurrence has been observed at Tokio.

The place at which an earthquake originates may be called the "focus," while the point on the earth's surface immediately above that is called the "epicentre." The shock naturally radiates outwards in all directions and, were the elasticities of the surrounding rocks the same, would be felt equally at places equidistant from the focus. Imaginary lines joining places at which the shock is felt to the same degree of intensity are called "isoseismal" lines, and in the case postulated above these lines should form concentric circles whose centre is the epicentre. The elasticities of rocks vary so considerably that the emergent path of an earthquake shock is seldom, if ever, a straight line, but is deflected many times in its course. This has been noticed on several occasions. Miners, for example, have reported shocks in mines when no tremor was perceived at the surface, and shocks plainly felt above have been unnoticed in underground workings.

Fault earthquakes are themselves divisible into three distinct kinds. Firstly, simple shocks, like the recent English example, where the shock begins with rapid tremors producing an effect like the passing of a motor-waggon. These tremors increase in strength and become less rapid until the climax is reached, after which they quickly fade away. The duration of such shocks in this country varies between four and eight seconds. Secondly, twin earthquakes, also recorded in Britain, where the effect is similar to that of two simple earthquakes separated by a short interval of time. Obviously this type is of longer duration, from about eight to sixteen seconds, and either the first or the second part may be the stronger. In countries where severe earthquakes are more common the duration may be considerably greater. Thirdly, complex earthquakes, which are by far the most serious. In these the shocks may last for minutes and there may be much variation in their strength and direction. In this type the ground level is often permanently altered, roads and railways twisted, fissures may be opened up as a veritable wave passes along the ground, and it is often quite impossible for people to stand up during the attack. Shocks like these are responsible for very heavy damage to life and property.

The onset of an earthquake is usually marked by a low rumbling sound, which may not be audible to unaided ears. After a short interval the tremors begin to be felt. An unusual quietude in the atmosphere with a physical sense of depression are features commonly reported by observers of earthquakes, and there appears to be some justification for the reports, although explanation of the phenomena is difficult.

Atmospheric pressure undoubtedly does play some slight effect in the periodicity of shocks, especially if long continued and over the sea. In this connexion it is interesting to note that three-fifths of the world's earthquakes occur during the winter



By permission of the Director of the Science Museum.

Fig. 2.—Distribution of the Earthquake Shocks of 7th June.

months, and the greater number are submarine in origin. The English earthquake of June last originated in some movement off the Yorkshire coast in the North Sea.

Earthquakes have been known and recorded in Britain for many years. Between the years 974 and 1916 no fewer than 1190 shocks were felt; of these, 310 were in England, 822 in Scotland, and 54 in Wales. The most frequently visited part of England is around Hereford, although the Manchester district has had numerous slight tremors. In Scotland, Comrie in Perthshire is the most " quaked " district in these islands, and perceptible tremors are of such frequent occurrence that little notice is paid to them. In the past British earthquakes have caused panic, superstition, and quackery. In Scotland the visitations were construed as direct action of the Almighty to warn wicked and perverse people, and the clergy took ample advantage of the opportunities afforded them to exhort and revile their flocks.

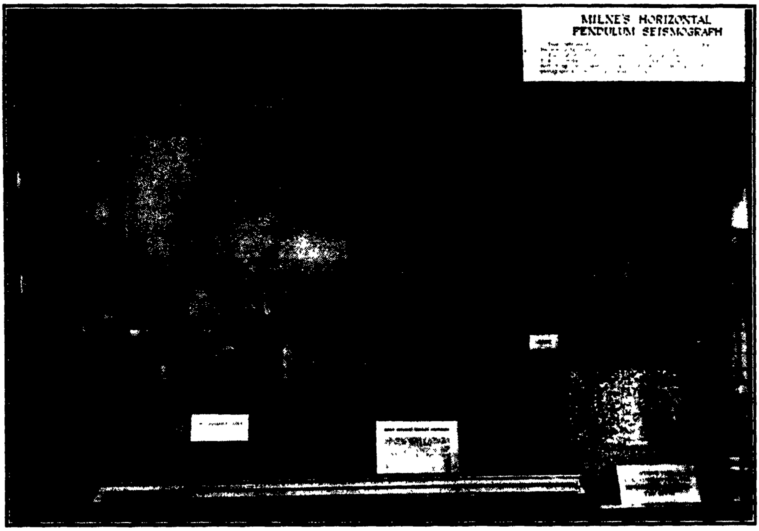
In 1580 an earthquake shock rocked the house of the Master of Gray, then under the displeasure of the Church as an apostate. King James VI, at that time a boy of fourteen, was curious to know why Gray's house " alone should shake and totter," and was told : " Sir, why should not the devil rock his own bairns ? "

Of a Scottish shock on July 23, 1597, the only apparently interesting feature recounted is that a Perth man's " thighs trembled; one leg went up, and another down."

More alarming was the shock of November 8, 1608, felt widely in Scotland. In Dumbarton the people were so afraid that they ran, led by their minister, to the Kirk, " to cry to God, for they looked presently for destruction." The reason given in Dumbarton for the disturbance was the extraordinary drought of the preceding months. The same earth tremor created great alarm at Aberdeen, where the Kirk Session held a special meeting, and, taking the shock as " a document that God is angry against this land, and against this city in particular, for the manifold sins of the people," appointed a day of fast. The immediate cause of the earthquake was here thought to be the salmon fishing practised in the Dee on Sundays, and the proprietors of the fishings were rebuked. Some promised to forbear, but others " plainly refusit."

In England among the earlier records the earthquake seems to have been the herald of strange things. Fiery dragons, comets, the moon the colour of blood, the earth swelling up by day and sinking with a sigh at night; all appear to have followed in its train. They have even been exploited commercially, for Addison wrote: " I remember when our whole island was shaken with an earthquake some years ago, *that there was an impudent mountebank who sold pills which, as he told the country people, were* good against an earthquake."

Of English occurrences definitely recorded, there was one in 1580, whose occurrence we have already noticed in Scotland, which affected London very much as the recent one did. The latter has been called " England's Worst Earthquake," and it may be so, but the previous worst was at Colchester on April 22, 1884, when Langenhoe Church was " terribly shattered " as the battlements crashed into the chancel. In Colchester itself houses were split and unroofed, and the populace rushed into the streets thinking that the gas works had exploded.



By permission of the Director of the Science Museum.

FIG. 3.—THE MILNE HORIZONTAL SEISMOGRAPH.

This comparatively simple type records the horizontal component of the earthquake photographically.

Fortunately, whatever results our earthquakes have had, fanciful or real, damage to life and property has been slight.

The determination of the origin of earthquake shocks is accomplished by seismographs. These are complicated but very delicate instruments, in which a pointer records upon a moving paper chart, much after the manner of a barograph. A shock many thousands of miles away will upset the indicator and record the tremor on paper. In this way shocks are known which are not perceptible to human beings. The records of seismographs in various observatories taken together will locate the focus of the shock.

Although such scientific recording instruments are comparatively modern, other methods were adopted by the ancients. Chinese priests, for example, are reputed to have obtained information about earthquakes by the simple expedient of filling a vessel with water and floating small wooden balls on the water. This vessel, placed in a suitable part of the temple or monastery away from human interference, was sufficiently delicate to record tremors not noticed by man. The earth shook, the vessel trembled, the water cast out the balls, and the priest took note. He was thus able to "foretell" earthquakes. When the news of the occurrence at last, after many days, reached his people he was hailed as a prophet and, unproverbially, had honour in his own country.

What of the future of earthquakes in these islands? Only one shock, in 1852, has so far been felt in all four divisions of Great Britain. The latest example, although it affected an area twice as great as any previous, did practically no damage. We do not, fortunately, live in an earthquake zone, and, although the periodicity is difficult to understand, there is no reason why we should be disturbed for many years to come; nor need we suppose that a future shock will be severe. London, by virtue of its clay foundation, is less likely to suffer than the rest of the country. It may be said with assurance that there is no cause to expect any serious disturbance in this country, not yet "the mountains shall depart and the hills be removed."

BOOK NOTICE.

Journals of Gilbert White. Edited by WALTER JOHNSON. Pp. xlviii + 463; 5 plates; 16 text-figures. (London: George Routledge & Sons. 1931. 21*s*.)

IN January 1768 Gilbert White received from the Honourable Daines Barrington a copy of his newly-published "Naturalist's Journal," and at once began to fill it up day by day, entering in the appropriate columns readings of barometer and thermometer, rainfall, notes on the first appearances of flowers and birds, and the like. He had been keeping, since 1751, a "Garden Kalendar" (printed in full in Dr. Bowdler Sharpe's edition of the "Natural History of Selborne"), but after the beginning of the Journal, the Kalendar was more and more neglected and was finally discontinued in 1771. The annual volumes of the Journal, however, were regularly filled in until a few days before White's death in 1793. At first the entries were for the most part confined to the narrow columns of the printed page, but very soon the column for "Miscellaneous Observations" overflowed and the diarist began to write across the page, sometimes on the back of the leaf, and even on extra inserted leaves. A great deal of the matter in these notes was used by White in writing his "Natural History of Selborne," published in 1788, and entries in the later volumes were abstracted by John Aiken in his "Naturalist's Calendar" (1795) and by Edward Jesse in his "Gleanings in Natural History" (1832). The manuscript of the Journal has been in the Library at Bloomsbury since 1881 and suggestions have been made that it should be published in full, but, as Mr. Johnson points out, this is neither practicable nor desirable. "Few persons can wish to read nearly ten thousand undigested daily records of temperature, wind and weather, to say nothing of innumerable entries concerning the first appearances of birds and insects and the flowering of plants." In this volume, however, Mr. Johnson has attempted to select and print in their original form and sequence "all those passages, not already used by White in his 'Natural History,' which have scientific worth, or which shed light on the social life of the old naturalist." The selection seems to have been done with judgment, and the result is a delightful volume which can be dipped into anywhere with pleasure. There is probably little of scientific value in the journals that has not been already published, but the figure of the old naturalist himself becomes strangely familiar and friendly as we follow from year to year the record of his doings in field and garden, of the coming and going of his beloved "Hirundines," of the slowly increasing weight of Timothy the Tortoise (whose carapace now hangs in the Reptile Gallery), and of the thrill with which he watched Blanchard's balloon pass over Selborne.

A note to which attention does not appear to have been called hitherto is that on Oct. 20, 1790, "Spring-keepers come up in the well-bucket. How they get down there does not appear: they are called by Mr. Derham—*squillæ aquaticæ.*" Mr. Johnson identifies these with the freshwater shrimp, *Gammarus pulex*, but that species is not commonly found in wells unless carried in by surface water. It is almost certain that White had seen specimens of the subterranean *Niphargus aquilex*, and that this is the first record of that remarkable form. If, as seems likely, "spring-keeper" is an old country name, it might with advantage replace "well-shrimp," which is merely a "book name," as the English equivalent for *Niphargus*.

RECENT IMPORTANT ALTERATIONS AND ACQUISITIONS.

A LARGER and more comprehensive exhibit illustrating the Locust plague has been installed in the last bay on the east (right) side of the Central Hall, replacing the one formerly in a small case near the Main Entrance. In the mouth of the bay is a greatly enlarged model (× 6) of the Desert Locust (*Schistocerca gregaria*), the species responsible for the recent invasions of Kenya, Transjordania, Palestine, and elsewhere, the gravity of which led in April 1929 to the appointment of the Committee on Locust Control. In the wall-case on the south (right) side of the bay is a series of specimens, photographs, maps, and diagrams, illustrating the subject of locust invasions and methods for their control. A scene, showing a locust swarm invading a cotton plantation in the Sudan, forms an introduction to the general exhibit.

A selection of the specimens, collected by Mr. Bertram Thomas in his expedition across the Arabian Desert and presented by him to the Museum, has been placed on exhibition in the Central Hall. The collection includes mammals, reptiles, amphibians, and insects.

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COLLECTING IN THE WEST INDIES.

By A. K. Totton, M.C., Assistant Keeper, Department of Zoology.

Although specimens accumulate in the Museum rapidly, perhaps at a faster pace than the Museum staff is large enough to cope with, nevertheless the Collections must for many a long day be imperfect. Gaps in those Collections are equivalent to gaps on the shelves of a reference library; they are the cause of much loss of time and efficiency when monographs or critical systematic reports are being prepared, or routine determinations made for correspondents in all parts of the world. For however carefully a species may have been described at any one time, yet the rapid growth of knowledge from time to time necessitates further reference to specimens to clear up questions of more detailed morphology or of variation and specific limits. For this reason the Trustees of the British Museum took the opportunity afforded by the Spring cruise of the Atlantic Fleet to the West Indies to ask permission of the Admiralty to accommodate a member of the scientific staff and a preparator in one of the ships of the Fleet, with the object of making as big a collecting sweep as possible of the West Indies.

A few days before Christmas 1930 the Director was informed that accommodation had been provided in H.M.S. "Rodney," one of the largest battleships in the world, and on January 6, 1931, Mr. S. L. Stammwitz and I joined her in Plymouth Sound with a large quantity of collecting gear and one hundred gallons of alcohol and other material for the preservation of specimens.

It was obvious that we two alone could not do a great deal in the thirty-eight working days all told that would be available at four different West Indian islands. Efforts had been made, therefore, before leaving the Museum to interest Officers in other ships of the Fleet in the work of the Museum. Captain C. B. Prickett, R.N., of H.M.S. "Norfolk," and Lieut.-Comdr. L. A. K. Boswell, R.N., of H.M.S. "Dorsetshire," both personally interested themselves in the venture, with the result that some of those ships' Officers, particularly Lieut.-Comdr. R. H. S. Rodger, R.N., of the "Norfolk," and Lieut. F. H. Mansell, of the "Dorsetshire," rendered the Museum valuable services by collecting in Barbados, Montserrat, St. Lucia, Dominica, Nevis, St. Kitts, and Anguilla, none of which islands were visited by the Museum representatives.

Leaving Plymouth Sound on January 8, in H.M.S. "Rodney," almost a hundred years to the day after Darwin sailed from the same spot in H.M.S. "Beagle" on his famous and much longer voyage, we arrived in the Gulf of Paria off Port of Spain, Trinidad, on January 23. Directly we came on deck and looked over the side of the ship, untold myriads of thé remarkable jelly-fish, *Stomolophus fritillaria,* could be seen in the water, extending from the surface down as far as one could see. It may be seen there for six months every year and often forms great patches a hundred miles in extent. The species is allied to our English *Rhizostoma pulmo,* but never becomes much larger than a tennis-ball. Curiously enough it appears to occur on both sides of the Isthmus of Panama, but nowhere else in the world; yet there is no evidence that the Atlantic and Pacific sides have been in

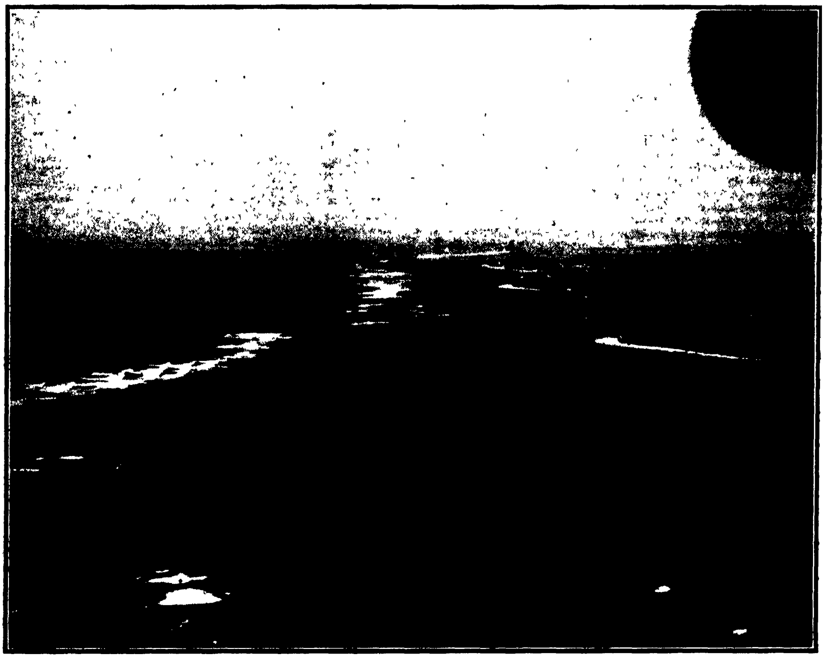

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FIG. 1.—An unusual view, between Ragged Point and Foul Bay, of the living coral-reefs of Barbados, which appears to have been passing through a process of re-elevation above the sea since late Miocene times. The first reefs to be formed are now nearly 1000 feet above sea-level, and the continuous succession of reefs forms a cap to the island from summit to sea.

communication since Miocene times. As there was not a single specimen in the Natural History Museum we were able at once to fill one gap in its Collections. It is said to be an excellent bait for the black Angel fish *Pomacanthus arcuatus*. Nothing whatever is known at present of the life-history of the species, and this problem we have asked the members of the Trinidad Field Naturalists club to try to solve. We received a great deal of help and information from the club's President, Mr. T. I. Potter, who procured for us a native hunter to go into the forest and get specimens of the Red Howling Monkey, the only large mammal of Trinidad which was not properly represented in the Museum. After a week's absence he came upon a troop of about thirty and shot a female and youngster, which we had to take to Tobago to skin.

Fig. 2.—The haunt of the "Fer de lance" and "Mapepire Z'anana," two of Trinidad's deadly poisonous snakes. Paix-Bouche Ravine and Quare Intake Road, where a general collection of insects, frogs, spiders, and fresh-water crustaceans was made.

Systematists had examined previously only three specimens of this Trinidadian monkey. Two specimens were taken and described by the Americans, J. A. Allen and F. M. Chapman, in 1894, and another skin in the Natural History Museum was described as the type of a distinct species by Elliot in 1910. *Alouatta insulanus* resembles the golden Howler, *A. juara*, of the upper Amazon and was formerly merged with it in the species *seniculus*. Its head and whiskers are maroon in colour and the upper part of the body and flanks red, in certain lights with a golden lustre. The limbs, hands and feet are bright red with a maroon tinge. Allen and Chapman described them as making a howling or roaring chorus in the early hours of the morning.

Whilst we were at Trinidad, a kindly and very hospitable fisherman of French descent, Mr. C. A. Delmas, freely gave us the use of his premises as our headquarters. It was conveniently near the Fish-Market, so that we were able with little trouble to preserve numbers of fishes, some of which, including a hammer-head shark, Mr. Stammwitz cast in plaster-of-paris after making colour sketches. We also got some useful catches of fish in six hauls of a seine net in Tetron Bay. Plankton collecting was out of the question owing to the dense population of jelly-fish. From time to time one of us would go off into the forest accompanied sometimes by a Naval Officer and Royal Naval Reservist bearers and sometimes by natives, whilst the other stayed at the base to deal with the rapidly accumulating material there. On one occasion Engineer Captain J. E. G. Cunningham, M.V.O., R.N., personally conducted us in his launch in the early hours of the morning some miles from our anchorage to a group of islands, where we had obtained the loan of a launch from the Quarantine Authority. There we occupied ourselves inshore collecting and dredging till we were thoroughly exhausted. I was much interested to see how the very active crab, *Grapsus grapsus* (Linn.), could jump across quite wide gaps between the rocks. We were gratified to find *Amphioxus* there for the first time. Large numbers of insects, particularly the smaller and less conspicuous ones, which might have been overlooked by previous collectors, and other animals both terrestrial and marine were preserved and sent off direct to the Museum on our hurried departure by the weekly Government steamer to Tobago.

Our reason for leaving the "Rodney" at this point for a week was that it was suddenly decided to prolong her visit to Trinidad, and we were anxious to do some collecting in Tobago. We had been asked to get specimens of the intrusive epidiorite of that island to confirm the theory of the continuity of the geological structure of Tobago and northern Trinidad, which itself agrees in a general way with that of the mainland of Venezuela and not with that of the West Indian islands. This was the only rock of the islands visited which I was asked to collect. We had no difficulty in finding it. All we did was to stop our car on its way from the steamer to our base at a pile of road-making material which proved to be what we were looking for. Subsequently specimens were obtained from an actual intrusion in Mount Irvin Bay. Messrs. Gordon Grant and Co., of Port of Spain, kindly let us use an old converted sugar-mill, Old Grange Tower, as our headquarters whilst in Tobago. It was near to and overlooked Buccoo Reef, so that we could have brought there alive for sketching and casting the brightly coloured fishes caught on the reef. We had been given to understand in Trinidad that the reefs at Buccoo, Tobago, were very good collecting grounds. They had, in fact, been explored, we found, by Dr. H. Lyman Clark some years before. We engaged Mr. P. L. Guppy in Trinidad to accompany us to Tobago as artist because we found by experience that it occupied one man's whole time to sketch and another's to make casts of the fishes. There we stayed for a week, working very hard to keep pace with all the material that soon started coming in from native collectors. The work of labelling, pickling and packing, including as it did several transfers of specimens from one grade of alcohol to another, took up a great deal of time, especially

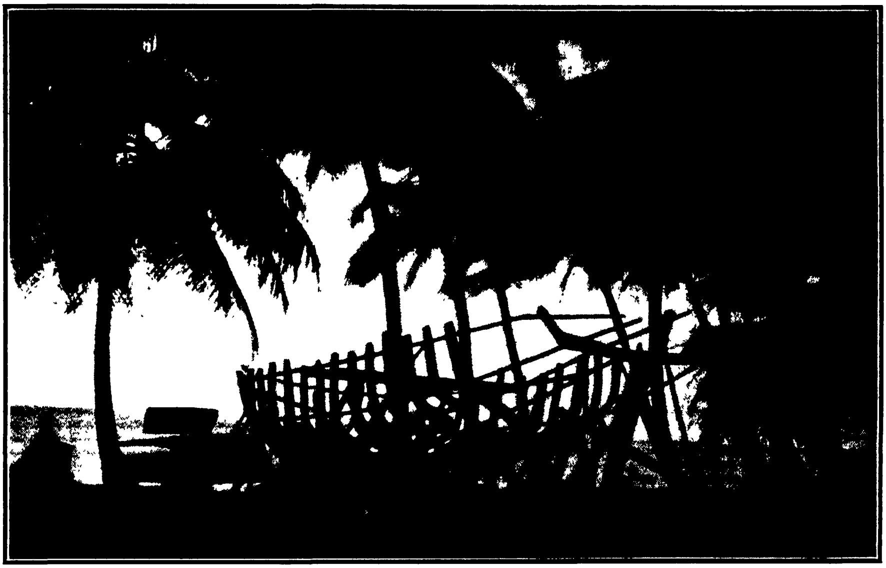

FIG. 3.—The roughly-hewn timbers of a trading sloop in construction on the shore of Mount Irvin Bay, Tobago, one of the claimants to be Robinson Crusoe's island.

since the specimens were soon, of course, in different stages of curing. Whenever possible we got out on to the reef itself by the one crazy sailing boat that was available. Boat-building material is hard to come by in Tobago, and the combination of rigging materials and the tattered garments of the hands gave the boat and crew a very grotesque appearance. Often during the passage out to the reef the two hands would have to jump out and pull the boat off a ledge into a new channel. They also were great adepts at chasing fish barefooted in the reef pools and transfixing them with pointed sticks.

At the time of our visit the island of Tobago was a very pleasant well-wooded spot, and viewed from the sea contrasted strongly with the parched and more or less treeless island of Antigua. Its numerous valleys and plentiful rainfall make it particularly suitable for the cultivation of cocoa. Its inhabitants are nearly all black in colour and still unspoiled. Tobago has never been colonized except by Scottish and English people. From the year 1765, when an advertisement was published in some of the newspapers in this country by the Commissioners for the sale of lands in certain West Indian islands, a large part was played in the development of the island by Aberdonians. When slavery was abolished in 1836 no less a sum than £130,000 was paid to the owners of the seventy-seven plantations in compensation. Cotton-growing flourished round about 1850, but after that the price dropped and it went out, never to return. After many ups and downs the palmy days for sugar cultivation ended between the years 1890 and 1900. Now that cotton and sugar have largely gone out of cultivation and made way for cocoanuts and cocoa, the inhabitants find it hard to get much employment, but they can with little difficulty satisfy their primary need for food; they say, however, that they want "something to go with it," and so a demand for cheap finery has been created.

We left behind with Mr. Tucker, of Speyside, a tank and preserving fluid for the collection of nestling Frigate birds which were desired, but could only be collected on Little Tobago at one time of the year when conditions were favourable. As in this case the nesting sites of sea-birds are generally inaccessible.

We rejoined the "Rodney" on her arrival at the end of the week and were taken on to St. Vincent, where we worked from February 13–22. We made our chief objective there the collection of specimens of thirteen species of birds that the Museum required. The list was not received till after our departure from the Museum, and, not being familiar with any of them, the difficulty was to identify the birds in the field. We managed to secure several of them, including the Black Hawk, *Urubitinga anthracina,* which frequents rivers and feeds on crabs. More than one valuable day was wasted in trying to effect a meeting with a native who had been working for an American ornithologist and was reputed to know the St. Vincent birds. He was in the middle of a drinking bout, and even when pressed into our service proved unreliable. Owing to his inability at the critical moment to loose off his rather antiquated fowling-piece, we missed several chances to secure Ringed Plover, which we particularly desired to bag. The only fire-arm we carried was a light stick-gun. The St. Vincent Parrot, *Amazona guildingi,* which we had permission to shoot, could not be secured although we saw some flying over the forest. A specimen that was shot could not unfortunately be retrieved owing to the impenetrable bush. It is a criminal offence to keep specimens captive, but the protective regulations appeared to be generally disregarded. Much interest was aroused on board the "Rodney," when at St. Vincent, by fish-eating bats belonging to the species *Noctilio leporinus.* They used to cruise up and

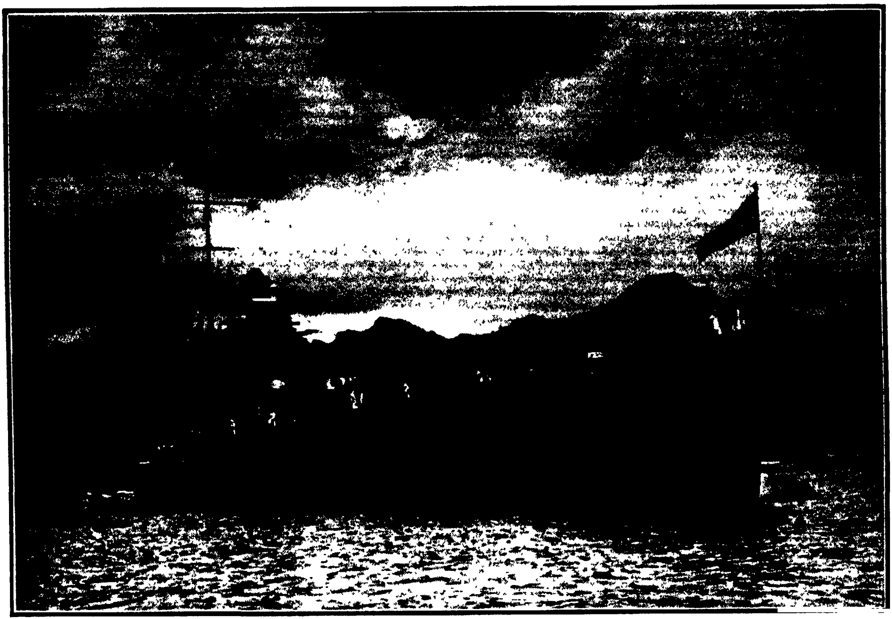

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FIG. 4.—H.M.S. "Rodney" lying at anchor in Kingstown Bay, St. Vincent.

down each night over the large shoals of small fish which congregated at the gangway lights. Although I had seen the bats fly past me at the foot of the gangway at such close range that I could distinguish most of their external features with ease, I could not convince the Officers that they were not birds until Lieut. Briggs, by the exercise of much patience and ingenuity, managed to shoot three specimens and bring them inboard. They provided a good catch of wingless parasitic Nycteribiid flies, which ran off them as soon as they were dead. We secured a large number of fishes that were needed for the Collections from the Fish-Market, dredged up quantities of invertebrate animals from Kingstown Harbour, and made some good hauls at night with plankton nets fished from a local motor-boat.

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FIG. 5.—Kingstown, St. Vincent, from the air. Dredging operations were carried on in the Bay, and hauls made with plankton nets.

At St. Vincent great efforts are being made to expand a promising trade with Canada and the Home Country in tomatoes and fresh vegetables. We were lucky enough to obtain the use of the old and outgrown Fruit and Vegetable Bureau as our headquarters, where we were able to stuff the birds and bats, and pickle fishes and other animals. It was here that a small black boy brought me a cardboard box without any accompanying message. I was very busy and, without stopping to think, removed the lid, whereupon out rushed two enormous spiders. The boy had his eye on them, however, and they were soon recaptured.

On February 23 we arrived off St. Johns, Antigua. The Governor of the Leeward Islands interested himself in the expedition and allowed us to establish our headquarters, first of all, in the Laboratory of the Government Chemist, Mr. A. E. Collens, and then in the Treasury building. He also lent us the Government motor-boat, formerly belonging to the American expedition from the University of Iowa, with which we did some good dredging and tow-netting work in Corbizon Bay. There is a fish-market close to the Treasury and we pickled large numbers of useful fish, after making colour sketches and plaster-of-paris moulds of some of them.

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FIG. 6.—Aerial view of the rim of the crater of St. Vincent's volcano, La Souffrière. The level of the water of the lake inside, which is a thousand feet from the rim, can be seen distinctly on the left side of the photograph.

We had been told that there were no Antiguan insects at all in the Museum Collections, so that we lost no opportunities to collect what we could in spite of the dry season. Mr. A. E.

Collens expressed his willingness to carry on this work, and the necessary collecting gear has been sent out to him.

Two collecting grounds that we explored were Guana Island and English Harbour, Nelson's famous Dockyard, whose sea-wall is thickly covered with marine animals, amongst which quantities of brightly coloured fishes may be seen darting about. It was here that the University of Iowa expedition made its headquarters in 1918.

The last phase of our work was a few days' collecting in the Bay of Algeciras on the way home to Plymouth via Gibraltar. Here for the first time we were able to get permission to use one of the ship's launches for our work. Hitherto, the fact that the ship had anchored some miles off the shore had made it impossible to give us the use of any of the ship's launches or picket boats, all of which were needed constantly for service purposes. Half-an-hour's tow-netting on several occasions provided large quantities of plankton, which was studied alive before being preserved in formalin, and much information of great use to a Museum specialist was thus obtained about the way in which Siphonophora and other marine animals behaved.

In all, many thousands of larger animals of most groups, including mammals, birds, reptiles, amphibians, fishes, tunicates, insects, arachnids, myriopods, crustaceans, molluscs, polyzoa, worms, echinoderms, cœlenterates, and sponges, as well as innumerable smaller ones and some plants, were brought home from an area covering Barbados, Montserrat, Trinidad, Tobago, St. Vincent, St. Lucia, Antigua, Nevis, St. Kitts, Anguilla, and the Bay of Algeciras. Every opportunity was taken also to establish contact with enthusiasts who might feel inclined to help the Museum in the future by making observations or collections.

No attempt was made, at the time, to write a journal or make much of a photographic record of our activities; but permission has been given by the Admiralty to use a number of photographs, taken from the air by Officers of H.M.S. " Courageous " and H.M.S. " Norfolk," as illustrations for this article. Acknowledgments are also due to the *Times* for permission to reproduce photographs of the " Rodney."

Throughout the three months' cruise we were treated with the greatest possible kindness and consideration by Captain R. M. Bellairs, Commander C. M. R. Schwerdt, himself a keen student of birds, and all those with whom we came in contact; and our numerous requests for help in transporting gear to and from the ship, for bearers, labour, and material, sometimes at very short notice, were invariably acceded to. Captain Bellairs

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FIG. 7.—Aerial view from the south-east of the Rock of Gibraltar, remnant of one limb of a great overturned fold of the earth's crust, which lies on the line of an original connection between Africa and Europe.

On the east side can be seen the water-catchment area, formed by cementing down the surface of the great talus-slope of sands and débris. The north front, a probable fault scarp, limits the sandy flats on which the neutral zone lies. The picture brings out the series of terraces at the south end which correspond with pauses in the change of sea-level.

even went so far as to obtain the Commander-in-Chief's sanction to stop ship in order to provide an opportunity to obtain temperature records and water samples with the Nansen-Pettersen water-bottle. Unfortunately on none of the four occasions on which the apparatus was used could the closing mechanism be induced to work, but it shows to what lengths Officers of the Royal Navy went in their eagerness to help on the work of the Museum.

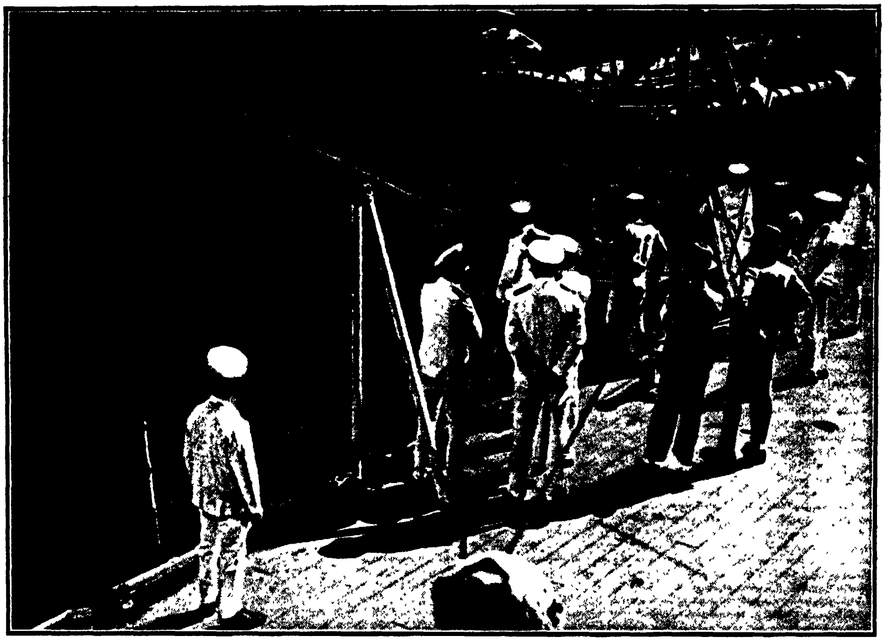

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FIG. 8.—Preparing to lower away the Nansen-Pettersen water-bottle, which may be seen slung outboard on a boom, and attached to the wire of one of H.M.S. "Rodney's" Lucas sounding-machines.

To give one or two illustrations of the sort of luck that may attend even an inexpert collector I will mention just three interesting specimens which were brought back from the West Indies. One of them is a small eel-like fish *Anguillichthys bahamensis* Breder, taken at lights off the gangway of H.M.S. "Norfolk" by Lieut.-Comdr. Rodger at St. Lucia. The species was described for the first time only four years ago from two specimens taken in the Bahamas. The morphological interest of this rare fish lies in the fact that unlike most eels its dorsal and anal fins are short and separated from the caudal. Lieut. Mansell was lucky enough to find under the first stone he turned up in Montserrat a snake, *Typhlops lumbricalis*, which had not been recorded hitherto from that island in spite of the fact that most of the West Indian islands have been well examined by Dr. Barbour for reptiles. We ourselves, knowing practically nothing about plants, were asked by our botanical colleague, Mr. A. H. G. Alston, to bring back material of the genus *Selaginella*. We were lucky enough to find in Trinidad specimens of *S. porelloides* (Lamk.) Spring, which was described from Trinidadian specimens by Lamarck as long ago as in 1791 and had not been found again, except for some specimens, which were obtained by Mr. Broadway in 1927, but had not been identified till after our record had been made.

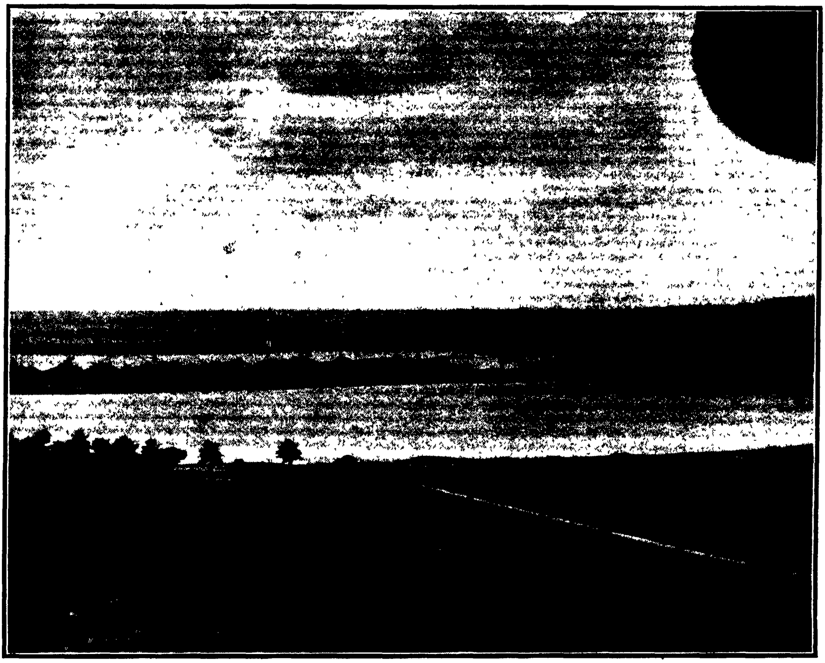

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FIG. 9.—The inland salt-making lake at Road Bay, Anguilla. In the offing can be seen H.M.S. "Norfolk," whose Officers made collections for the Museum at this and other islands.

Considering that the Museum was not aware until December 18 of the fact that the Atlantic Fleet was about to visit the West Indies and that the two representatives and all the collecting gear had to be aboard the "Rodney" on January 6, there was little or no time to make detailed plans, and programmes depended on our reconnaissance of each island as we came to it. As a rule at least a week's preliminary survey is needed before useful collecting can be started, but in this case hardly more than that time had to suffice for a survey, establishment of a shore base, collecting, pickling, and packing up again. Often we left the ship at 5.30 am., worked all day with little or no food whilst ashore, and carried on after our return with the pinning of insects and similar work in the hot atmosphere of an armoured ship's cabin in the tropics until 1 a.m.; but the excitement of not knowing what the next day or the next island would produce was quite sufficient to keep us up to the mark, and our fatigue was rapidly overcome thanks to the comfort and help obtainable in the "Rodney."

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FIG. 10.—Dominica, the highest and best afforested island of the Lesser Antilles. View looking westwards across to Trois Pitons (4600 ft.).

THE PAUSSIDÆ, A STRANGE GROUP OF BEETLES.

By Gilbert J. Arrow, Deputy Keeper, Department of Entomology.

It is well known that some of the strangest living forms are found amongst animals that have adopted a parasitic mode of life. Removed from the necessity of an active struggle for existence, many of the qualities essential for success under normal conditions become actually disadvantageous, while some which would lead to inevitable failure in ordinary circumstances become entirely desirable. Thus results a complete reversal of conditions we have come to regard as proper to mundane existence.

Some of the most remarkable insects known to us occur amongst those living in the nests of ants and termites, where they are sheltered from the many dangers of the outer world and fed by or at the expense of their hosts. Representatives of many different groups have adopted this mode of life. Conspicuous amongst them is a family of beetles called Paussidæ, of which many curious species are found in Africa, India, Australia, and other warm regions. The Paussidæ are a peculiarly modified group of Geodephaga (predaceous ground beetles), and are endowed with a means of defence unknown outside that tribe of beetles. Like some other Geodephaga they are able, when disturbed, to produce an explosive discharge from the end of the body, accompanied by a puff of vapour; the effect upon the human skin is to produce discoloration and a burning sensation. It has been noticed that the insects invariably remain passive, when hustled by the ants in whose nest they are found, and even allow themselves to be dragged away by the jaws of their hosts, but, if touched by any unknown body, they respond by an immediate discharge of the explosive fluid.

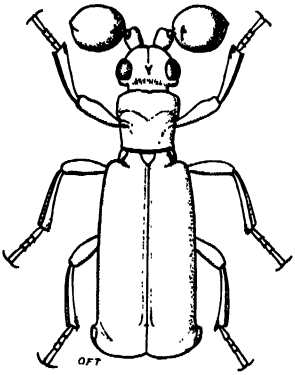


Fig. 1.
Paussus sphærocerus.

Another remarkable fact published long ago concerning one of these beetles seems to have been since forgotten. The *Transactions of the Linnean Society of London* for 1798 contain an account of the discovery of one of the earliest known representatives of the family by Dr. Adam Afzelius, Demonstrator of

Botany in the University of Upsala, who named the species *Paussus sphærocerus* (Fig. 1). He described his discovery as follows :—

> "I had been in Africa almost three years before I happened to meet with this remarkable little insect, and then it was quite accidentally. There was a house building for the Governor, on an eminence called Thornton Hill, at the south end of Freetown, in Sierra Leone; and in the beginning of the year 1796, several apartments having been got ready so as to be habitable, one of them was allotted to me, and I removed into it in the end of the month of January.
>
> "I had not resided there many days when one evening, having just lighted my candle and begun to write, I observed something dropping down from the ceiling before me upon the table; which, from its singular appearance, attracted my peculiar attention. It remained for a little while quite immovable, as if stunned or frightened, but began soon to crawl very slowly and steadily.
>
> . . . .
>
> "Some few days after, coming into my room from supper with a light in my hand, and having put it upon the table, there instantly fell another down from the ceiling. The third I was favoured with by the then Governor, Mr. Dawes, who informed me that it had dropt down before him on the table, just when he had entered his room and was going to write. The other three which I afterwards collected were also got upon similar occasions.
>
> . . . .
>
> "The last which I caught I put into a box, and left confined there for a day or two. One evening, going to look at it, and happening by chance to stand between the light and the box, so that my shadow fell upon the insect, I observed, to my great astonishment, the globes of the antennæ, like two lanthorns, spreading a dim phosphoric light. This singular phenomenon roused my curiosity, and, after having examined it several times that night, I resolved to repeat my researches the following day. But the animal, being exhausted, died before the morning, and the light disappeared."

It is remarkable that, although this observation was made 135 years ago, the occurrence of luminosity in the Paussidæ has since remained unrecognized. Since Afzelius wrote his account more than 300 other species of the group have been described, but the considerable literature of which they are the subject seems to contain no confirmation of his discovery of the light-emitting antennæ. Considering that we know exceedingly little as to the life-history and habits of any of these strange creatures there is perhaps no occasion for undue surprise in this. I am able, however, to produce one interesting piece of confirmatory evidence which has lain unnoticed in the Museum for seventy years. A specimen of another Paussid, *Cerapterus latipes* (Fig. 2), taken at Coimbatore in Southern India by Mr. W. J. Walhouse and presented by him to the Museum in 1860, bears the following note in the handwriting of Adam White, curator of insects at the time:—"Mr. W. remarked it was luminous and crepitated."

Although there is no record in this case as to the part of the body from which the light is emitted, the fact that luminosity has been observed in two members of the family inhabiting regions so remote one from another as Sierra Leone and Southern India renders it probable that the phenomenon is no rare one. Perhaps it is only necessary for its existence to become known for confirmation to be forthcoming. It would be interesting to learn whether the antennæ are the source of the light in *Cerapterus latipes* as they are in *Paussus sphærocerus*, for, although the antennæ of both are short and massive as in all the Paussidæ, they are otherwise very different and consist in the first species of only two joints and in the second of ten.

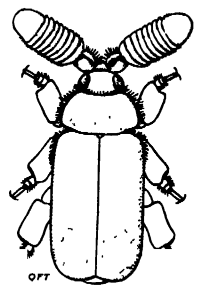


Fig. 2.
Cerapterus latipes.

The Geodephaga in general are distinguished by their great agility and their very slender and delicate antennæ, composed of eleven distinct joints as in most beetles. The Paussidæ, on the contrary, are clumsily built creatures, sluggish in their movements, and their antennæ are short, compact appendages, apparently without any of the essentials of these normally highly sensitive and mobile organs. A compact bodily form is no doubt better suited to the narrow, crowded galleries, primarily intended for much smaller creatures, in which these beetles live, than is the long-limbed ancestral shape; but the massive antennæ are in such startling contrast to those of other insects that it seems almost impossible that they can serve as tactile organs at all. They have a variety of strange forms: some resembling scimitars, some more like blunderbusses, others like hollow shells with beautifully scalloped edges; *Paussus sphærocerus* has a pair of smooth round globes, pale yellow in colour, which might reasonably have been compared to lamps, although without Afzelius' statement it would have seemed highly improbable that they could actually serve that purpose. It must be remembered that much more important to insects than the tactile sense is that of smell, which is also located in the antennæ.

Two other curious uses of these organs in the Paussidæ have been described. A naturalist, W. H. Benson, when watching a species found near Cape Town, noticed that, if one of the beetles fell upon its back, it could only regain its feet by using one of the stout antennæ as a lever to raise itself up, in the same way as the King-crab uses its caudal spine. It is likely that such misadventures are fairly frequent in the busy thoroughfares of the ants' nest.

A resident in Natal, Mr. Gueinzius, has published an interesting observation upon another South African species in the following words :—

> " On one very hot afternoon, between four and five o'clock, immediately before a thunderstorm, I saw in the red sand of the roads, on a woody hill, a long train of ants busily running backwards and forwards, and I remarked among them a Pentaplatarthrus gently led by its antennæ by several ants, which accompanied it in the common procession. My first idea that it was forcibly held against its will I gave up when, on this and following days, I several times saw the same fact occur on the approach of a thunderstorm."

The Paussids are much-valued inmates of the nest and, when the ants find themselves obliged to move and establish a new colony, they take the necessary steps to ensure that they shall not be parted from their treasured guests.

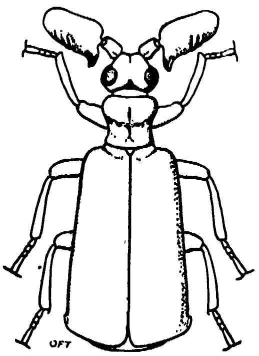


FIG. 3.
PAUSSUS AFFINIS.

One of the most interesting facts concerning this strange group of insects is the survival of numerous "living fossils," that is, still existing representatives of the various stages through which they have passed in the course of their evolution; so that it is possible to trace the gradual development of their highly abnormal antennæ from the long threadlike "feelers" whence they are derived.

The globular antennæ of *Paussus sphœrocerus* may be considered one of the most highly modified types. They consist only of the small joint, which always forms the attachment to the head, and the large sphere, which, however, has a fine stalk, not at the point of attachment, but behind it, and ending in a tuft of fine hairs. In most other species the large terminal joint is less short and balloon-like. In several, such as *Paussus affinis* (Fig. 3), it is somewhat kidney-shaped, and upon its surface several short parallel grooves can be seen. These are the last traces of the separate segments of which it was formerly composed. Generally only about four such grooves are distinguishable, but some species, in which the organ is less shortened, show as many as six or eight. In the Siamese *Lebioderus percheroni* (Fig. 4) there are still more distinct indications of segmentation. The two edges are deeply divided, forming five lobes in front and five behind, each lobe ending in a tiny tuft of hairs like the single one in *Paussus sphærocerus.* In *Lebioderus goryi* (Fig. 5), a still more primitive form occurring in Java, the divisions along the two edges are united by shallow grooves, so that, although quite solid, the organ shows five distinct divisions. A yet older condition is preserved in the genus *Pleuropterus* (Fig. 6), the antennæ of which form broad ribbons showing ten transverse divisions. One step farther back brings us to the condition in which there are ten movable joints, not yet fused together, although so closely applied one to another that movement is possible in one direction only. This is the state in the Indian *Cerapterus latipes* (Fig. 2), whose luminosity has been mentioned, and in *Carabidomemnus* (Fig. 7). Finally, the most primitive form of all is the rare *Protopaussus* (Fig. 8), in which the full number of eleven joints occurs, and these are freely movable in all directions. Between these main stages in

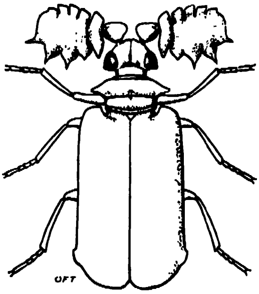


FIG. 4.—LEBIODERUS PERCHERONI.

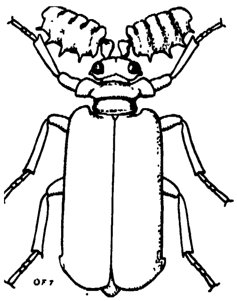


FIG. 5.—LEBIODERUS GORYI.

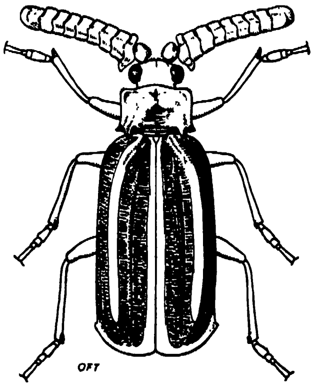


FIG. 6.—PLEUROPTERUS PARALLELICORNIS.

the transformation intermediate degrees also exist, so that the whole process by which a very slender and flexible organ has become a very short solid one is revealed in detail. A comparison of the figure of *Protopaussus* (Fig. 8) with that of *Pachyteles mexicanus* (Fig. 9), a member of the family Carabidæ, will show conclusively that this is the stock from which the Paussidæ have

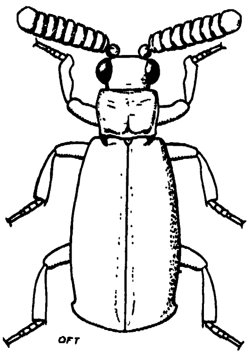


FIG. 7.—CARABIDOMEMNUS HARGREAVESI.

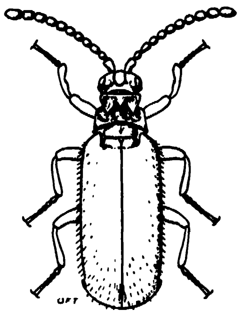


FIG. 8.—PROTOPAUSSUS WALKERI.

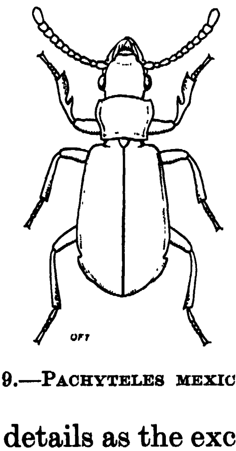


FIG. 9.—PACHYTELES MEXICANUS.

descended. Such small details as the excision of the inner side of the foreleg and the tiny lobe towards the end of each wing-cover emphasize the closeness of the relationship. The little lobe indicates a slight folding of the margin which seems to form a kind of spout, perhaps to direct the explosive fluid which is common to both types. Indeed, *Protopaussus* forms an exact link between the two families, which before its discovery appeared so distinct that the relationship between them was disputed; no doubt now remains. Although it is impossible to separate *Protopaussus* from the other Paussidæ, it has all the essential features of the Carabidæ also, and might with equal fitness be assigned to that family.

It is interesting to trace the degeneration in another respect that has accompanied the loss of the agility characteristic of the predaceous ancestors of the group. *Pachyteles*, in common with all its tribe, has five joints to each foot, the first joint rather long. In *Protopaussus* (Fig. 8), although the form of the body suggests a lower degree of activity, the feet remain practically the same, but in *Carabidomemnus* (Fig. 7) they are less flexible and the first joint is shorter. In *Pleuropterus* (Fig. 6) this joint is very short, and in all the still more aberrant forms, represented above, it has vanished completely from view. In *Cerapterus* (Fig. 2) still further shrinkage has taken place.

Why such various and such weirdly shaped antennæ are found in this group of beetles we cannot tell, but forms of antenna almost identical with some of those mentioned here have been independently acquired by other insects quite unrelated to the Paussidæ but, like them, living in the nests of ants; for instance, certain little Australian beetles belonging to the family Ptinidæ and others belonging to the family Pselaphidæ. An important feature of the Paussidæ is the possession of certain internal glands, secreting a liquid which affords great gratification to the ants in whose nest they live, and for the sake of which they are allowed to enjoy its protection. The orifices of these glands are generally, but not always, upon the thorax, which often has peculiar hollows provided with brushes of hairs, from which no doubt the ants suck the pleasant fluid. It is possible that the hair-tufts mentioned above as existing upon the antennæ in certain cases may mask such orifices, and that the swelling and solidification of the organs may have accompanied the growth and elaboration of secretory glands. The beautiful shell-like form, which is one of the common types of antenna, perhaps serves to provide a hollow cup in which the sweet liquid may collect.

JUBILEE (QUINQUAGENARY) CELEBRATION.

THE fiftieth anniversary of the opening of the Natural History Museum building at South Kensington was celebrated on Tuesday, September 29. The building was first opened to the public on April 18, 1881, but the date of the celebration was postponed until the close of the Centenary Meeting of the British Association for the Advancement of Science, which was to take place in London from September 23 to 30, and was likely to prove an occasion to draw an exceptionally large number of scientists to London. Unhappily the generally unfavourable financial position throughout the world prevented many of the institutions invited from sending representatives to the celebration, and the difficult situation which developed in Great Britain in August adversely affected the programme which had been planned in connexion with the celebration. Nevertheless, over one hundred representatives of museums and learned societies at home and abroad were present. Public attention was drawn to the anniversary by the dates in large figures, illuminated at dusk, which had been placed on the front of the building: "1881" on the west tower, "1931" on the east tower, and "1753" (the date of the foundation of the British Museum) in the centre above the main entrance.

The delegates were welcomed by the Trustees at a meeting held in the afternoon in the Reptile Gallery, which had previously been cleared for the use of Section D (Zoology) of the British Association. In the absence of a Principal Trustee the Earl of Crawford and Balcarres, Chairman of the Jubilee Sub-Committee of the Trustees, presided and had with him on the platform three of the Trustees—Lord Rothschild, Sir Frederick Hopkins, and Mr. F. Cavendish Bentinck—as well as the Director, Dr. C. Tate Regan, and the Secretary, Dr. G. F. Herbert Smith.

Lord Crawford said that on behalf of the Trustees and the Staff of the Museum he offered a most friendly welcome to those who had done them the honour of being present on the occasion of celebrating the fiftieth anniversary of the opening of the Natural History Museum building. No fewer than 135 institutions were represented, and of that number forty were overseas. As so much of the collections in the Museum represented activities and researches carried out beyond their shores, it was very gratifying to see so many visitors. He was presiding in the absence of any Principal Trustee. The Archbishop of Canterbury, the Chairman of the Board, had written to express his regret that he was unable to be present at the Jubilee Celebration. Lord Crawford went on to say that the King's Private Secretary had been asked: "To bring to the notice of the King that the Fiftieth Anniversary of the Opening of the Natural History Museum building at South Kensington will be celebrated on Tuesday next, the 29th September, and that the Trustees and the Staff of the

Natural History Museum take the opportunity to submit their respectful and loyal homage to His Majesty, who has at all times graciously taken a keen interest in promoting the welfare of the Museum and its Collections and was for many years himself a Trustee. On the afternoon of that day the Delegates of Museums and Learned Societies at home and abroad will assemble in the Museum to celebrate the Anniversary, and will be received by the Trustees." To this message His Majesty had sent the following reply :

"I sincerely thank the Trustees and Staff of the Natural History Museum for the loyal message they have sent to me on the occasion of the Jubilee anniversary of its opening at South Kensington. Please be good enough to express my congratulations on this great event and assure the delegates from the British Isles and from across the Seas of my unabated interest in and best wishes for the work that is being carried on by the Natural History Museum and kindred Societies both at home and abroad. GEORGE R.I."

The Director addressed the delegates in the following words : "It is my privilege, on behalf of the scientific staff of the Natural History Museum, to offer a hearty welcome to the delegates who have honoured us by coming here to-day; in particular we are glad to see those who represent museums and scientific societies in other countries and in overseas parts of the Empire; it is a great pleasure to renew old friendships with some of them, and to make new friends of others.

"For over a hundred years the Natural History collections formed part of the British Museum at Bloomsbury; all I will say of those old days is that much good work was done on the collections and many famous men were connected with them. I will mention only two : Robert Brown, the botanist, who discovered Brownian movements, the streaming of protoplasm, and the cell nucleus, and John Edward Gray, the first Keeper of Zoology, who in the face of great opposition began to form study collections as distinct from the exhibited collections, and who initiated the preparation and publication of catalogues or systematic monographs. Fifty years ago an important event took place. This building was completed, and the collections were transferred to it. The plans of the Museum—were accepted in 1871, sixty years ago; at that time it was still the custom to exhibit nearly everything, and to house the main collections in the exhibition galleries. The museum is old-fashioned; it was built too soon, and we have to make the best of it.

"One aim of the Museum is to interest and instruct the public by means of the exhibition galleries. In the fifty years we have made slow but steady progress; we have only a few preparators; we have not much money to spend; we are hampered by the fact that many of the galleries serve for storage as well as exhibition, and are full of table cases, or cabinets of drawers, for which we have no room anywhere else. We know well that we are behind some of the great museums in America and that the number of our visitors, over half a million a year, would not be considered satisfactory in New York. Still even this number testifies that there is something to see. The other main business of the Museum is to form collections of all natural objects, to classify them, describe them, and arrange them so that they are accessible for study.

"The collections that were transferred from Bloomsbury fifty years ago were already important; now they are at least six times as large. The insects have increased from one million to eight millions, the birds from 60,000 to

600,000, the fishes from 40,000 to 175,000, and other collections have grown at the same rate. We have found room for these by utilizing the basement, by cutting off exhibition galleries from the public, and by a certain amount of new building. Fortunately, because of the risk of fire, we have always had separate buildings for the collections in spirit. A few years ago I told the Royal Commission on National Museums and Galleries that for our zoological collections, other than those in spirit, we needed a large quadrangle to the west of the Museum—a building five stories high, with studies and store-rooms. That would allow our exhibition galleries to be used for exhibition. In the Berlin Museum the area occupied by the scientific collections is five times that of the exhibition galleries; it has the quadrangle that I wanted.

"Our predecessors have handed on to us a tradition of naming, arranging, and cataloguing the collections which becomes increasingly difficult to carry on. We are proud of the catalogues published by the Museum; many of them are the only complete monographs of the groups they deal with. Günther's Catalogue of Fishes, Boulenger's Catalogues of Reptiles and of Batrachians, the Catalogue of Birds by Bowdler Sharpe, and others—these are examples. We should like to continue, but the size of the collections, and the increase in literature, make the preparation of such catalogues beyond any man's capacity.

Fifty years ago a man of science was not considered quite respectable. It was not surprising, therefore, that it was considered the natural thing for the Director of the British Museum, an educated man, to continue to supervise the Natural History Museum. We are a conservative people, and that arrangement lasted fifty years, during which the opinion of a man whose interests were not ours carried most weight; he had the final word, and he represented us in dealings with the Treasury. That very unsatisfactory state of affairs has now ended; we celebrate this year not only our Jubilee, but also our independence.

"The members of the scientific staff of the Museum are mostly honours graduates, although some have been trained in other ways. Their work requires them to concentrate and to use their brains. Classification and taxonomy are important branches of science that can be studied only by means of large collections such as those in this Museum. The field we cover, the whole world of nature, is a sufficiently wide one, and our work brings us to the consideration of such matters as the history of the earth, organic evolution, and man's place in nature. We feel that we have some culture, and that we can make some contribution to philosophy. In addition, our work has a practical importance in relation to such matters as health, agriculture, and mining. For these reasons we, like other men of science, tend to develop a superiority complex. But that is not much good to us. In spite of the work of the British Association I think that only a small proportion of the voters of the country, or of our members of parliament, have any understanding of or appreciation of science. A scientific education counts for less towards a career than any other sort of education. We find that there are other people with superiority complexes—for example, the people with a knowledge of classical literature—and we have to admit, judging the matter from the positions they occupy and their influence, that they have some justification for it."

The delegates were then welcomed individually on the platform, and many of them presented addresses from the institutions that they represented.

Prof. E. Goldschmid conferred on Dr. Regan the honorary membership of the Senckenbergische Naturforschende Gesellschaft of Frankfurt-am-Main. Prof. E. Lönnberg drew attention to the long duration of the friendly relations

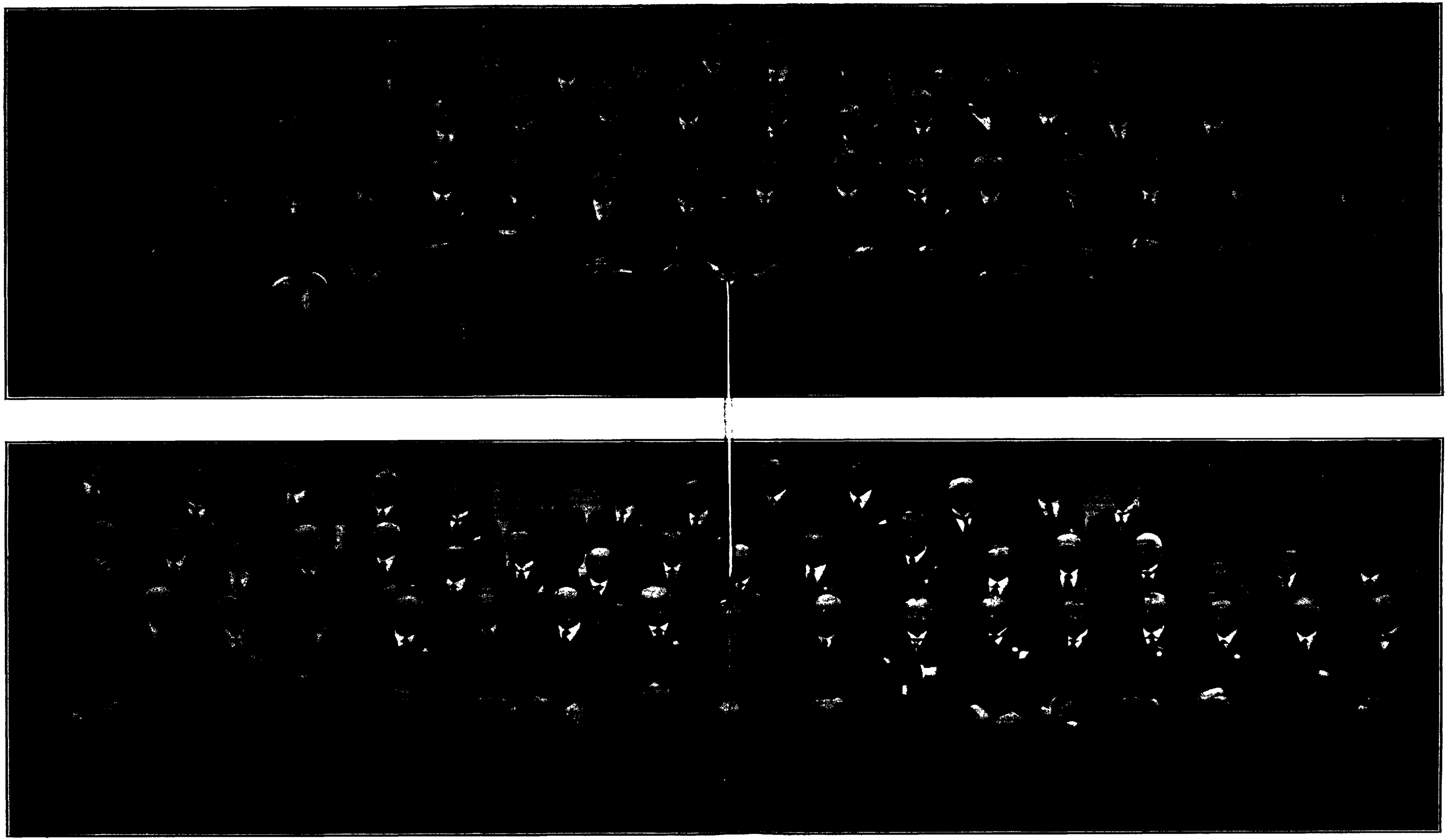
BRITISH MUSEUM (NATURAL HISTORY)

JUBILEE CELEBRATION

of the

NATURAL HISTORY MUSEUM BUILDING

Group Photograph of Delegates taken at the Reception by the Trustees,
September 29, 1931.



Photograph by the London Panoramic Company.

JUBILEE CELEBRATION OF THE NATURAL HISTORY MUSEUM BUILDING, SEPTEMBER 29, 1931.
Upper Picture represents Left and Lower Picture Right of Group.
The Chairman, Earl of Crawford and Balcarres, K.T., is seated fourth from left in Lower Picture.

between the British Museum and the Naturhistoriska Riksmuseum. In 1735 Linnæus came to London and made the acquaintance of Sir Hans Sloane, who showed him his rich collections. On his return to Sweden Linnæus and some friends of his founded the Swedish Academy of Science, which began the collection of natural history specimens that formed the nucleus of the Swedish Museum of Natural History. Generations of students had come over from Sweden to learn, and some remained, among them Solander. Prof. H. Fairfield Osborn said that he represented a daughter institution, for the plans of the Natural History Museum were submitted to the founder of the American Museum of Natural History in 1869. He thought it would interest them to know that there were now in the United States many flourishing granddaughter museums.

That closed the formal proceedings, and the delegates and the rest of the company present adjourned to the adjacent New Whale Room for refreshments. The official photograph, which is reproduced in this number, was taken there.

In the evening the Government gave a reception at the Museum in honour of the Jubilee Celebration. The guests were received by the Prime Minister, Rt. Hon. J. Ramsay MacDonald, M.P., and Miss Ishbel MacDonald.

On the following day, September 30, many of the delegates visited in the morning the Tower of London, where they were received by the Major and Resident Governor, Lieut.-Col. Dan Burges, V.C., D.S.O., and in the afternoon Lambeth Palace, where they were received by the Chaplain, Rev. A. Sargent, in the absence of the Archbishop of Canterbury. The delegates were also invited to the reception given in the evening at the Guildhall by the Lord Mayor and Corporation of the City of London to the British Association for the Advancement of Science.

Among the delegates present were: Dr. M. Glaessner (Vienna), Prof. Dr. Van Straelen (Brussels), Dr. Th. Mortensen (Copenhagen), Prof C. Gravier (Paris), Dr. R. Regnier (Rouen), Prof. Dr. C. Zimmer (Berlin), Prof. Dr. E. Goldschmid (Frankfurt-am-Main), Dr. M. Rauther (Stuttgart), Prof. Dr. L. T. de Beaufort (Amsterdam), Prof. Dr. C. F. Kolderup (Bergen), Prof. Dr. A. R. Jorge (Lisbon), Prof. C. Bolivar Pieltain and Señor A. Gil Lletget (Madrid), Prof. E. Lönnberg (Stockholm), Mr. C. E. Lord (Hobart), Dr. C. E. Fenner (Adelaide), Prof. E. W. Skeats (Melbourne), Prof. J. T. Wilson (Sydney), Prof. A. S. Eve (Montreal), Dr. K. R. Hanitsch (Kuala-Lumpur), Mr. W. S. Millard and Sir Reginald Spence (Bombay), Sir Edwin Pascoe (Calcutta), Mr. H. W. Tinne (Auckland), Dr. D. Colquhoun (Dunedin), Hon. J. W. Downie, C.M.G. (Bulawayo), Prof. N. J. G. Smith (Grahamstown), Mr. H. Coolidge (Cambridge, U.S.A.), Dr. G. G. MacCurdy (New Haven), Prof. H. Fairfield Osborn and Prof. W. K. Gregory (New York), Dr. C. E. Resser and Dr. C. G. Abbot (Washington), Dr. G. F. Hill, C.B., Mr. W. A. Marsden, Mr. H. I. Bell, Mr. L. D. Barnett, Mr. R. A. Smith, and Mr. A. Esdaile (British Museum, Bloomsbury), Prof. E. J. Garwood, F.R.S. (Geological Society of London), Sir John S. Flett, K.B.E., F.R.S. (Geological Survey and Museum), Dr. H. S. Harrison (Horniman Museum), Dr. S. A. Neave (Imperial Institute of Entomology), Prof. F. E.

Weiss, F.R.S. (Linnean Society), Prof. A. Hutchinson, O.B.E., F.R.S. (Mineralogical Society of Great Britain and Ireland), Sir Arthur W. Hill, K.C.M.G. (Royal Botanic Gardens), Sir Frank E. Smith, K.C.B., C.B.E., F.R.S. (Royal Commission for Exhibition of 1851), Sir Frederick G. Hopkins (Royal Society), Col. Sir Henry Lyons, F.R.S. (Science Museum), Mr. E. R. D. Maclagan, C.B.E. (Victoria and Albert Museum), Sir Peter Chalmers Mitchell, C.B.E., F.R.S. (Zoological Society of London), Mr. H. J. Sargent (Bexhill), Mr. D. Payler (Birmingham), Dr. F. S. Wallis (Bristol), Mr. C. Forster Cooper (Cambridge), Dr. C. Fox (Cardiff), Mr. N. L. Silvester (Doncaster), Rev. Canon J. C. Mansel-Pleydell (Dorchester), Dr. P. O'Connor (Dublin), Mr. P. Grimshaw and Prof. J. H. Ashworth (Edinburgh), Mr. F. R. Rowley (Exeter), Dr. Ethel Currie (Glasgow), Mr. F. A. Oldaker (Haslemere), Mr. B. H. Soulsby (Hastings), Mr. R. Aitken (Hawick), Dr. T. W. Woodhead (Huddersfield), Mr. T. Sheppard (Hull), Prof. W. Garstang (Leeds), Dr. E. E. Lowe (Leicester), Dr. D. A. Allan (Liverpool), Rev. G. H. Carpenter (Manchester), Mr. T. Russell Goddard (Newcastle-on-Tyne), Mr. W. A. Gunn (Newport), Mr. F. Leney (Norwich), Mr. C. F. Pitman (Nottingham), Mr. E. T. Leeds (Oxford), Prof. E. B. Poulton, F.R.S. (Oxford), Dr. R. V. Favell and Mr. W. J. Bazeley (Penzance), Mr. J. W. Bodger (Peterborough), Dr. E. J. Allen, F.R.S. (Plymouth), Mrs. G. E. Bullen (St. Albans), Mr. H. J. M. Maltby (Salford), Mr. J. W. Baggaley (Sheffield), Councillor J. R. Gosling (Stockport), Mr. J. A. Charlton Deas (Sunderland), Mr. H. St. George Gray (Taunton), Mr. A. S. Hemmy (Torquay), Dr. K. Jordan (Tring), Mr. L. A. Curtis Edwards (Wisbech), Mr. J. T. Houghton (Worksop), Miss Marian Frost (Worthing), and Mr. S. Walker (York).

BOOK NOTICES.

Ethnos, or The Problem of Race. By SIR ARTHUR KEITH. To-day and To-morrow Series. Pp. 92. (London : Kegan Paul, Trench, Trübner & Co., Ltd. 1931. 2*s*. 6*d*.)

WE are all agreed that Biology, and in particular Anthropology, has many lessons to teach the politician and statesman. There is, perhaps, not quite so much agreement as to what these lessons are. In this little book Sir Arthur Keith sets forth, with all his accustomed vigour and clarity of style, his views on one of the most perplexing problems of our post-war world. Briefly, his argument is that national feeling or patriotism instead of being a product of racial difference has been rather a main factor in the evolution of races. It is a long way from " endocrine balance " to the League of Nations, but it is a stimulating and thought-provoking experience to travel along it in Sir Arthur's company.

The Fabrician Types of Insects in the Hunterian Collection at Glasgow University. Part I. By ROBERT A. STAIG. Pp. xvi + 110, with 28 plates in colour. (Cambridge University Press. 25*s*.)

THIS book contains an account of the types of twenty-eight species of Coleoptera (beetles) contained in the collection of Dr. William Hunter, Physician to Queen Charlotte, bequeathed by him to the University of Glasgow. About two hundred species of insects were first named and described from Hunter's collection by Fabricius, the pupil and follower of Linnæus. The present work provides at the same time an excellent example, in its recognition of the great importance of original type specimens, and a warning, in the deplorable condition of many of the specimens represented, due to the failure of the author's predecessors to recognize their importance and to take proper care for their preservation. Mr. Staig says in his preface : " The coloured plates represent the specimens with all their existing defects due to the age of the Hunterian collection "; but there is good reason for believing that with due care such specimens can be preserved in good condition almost indefinitely. Almost worse than the failure to give adequate protection to the specimens is the carelessness with which they have been separated from the labels that originally recorded their names and origins. Mr. Staig has endeavoured with admirable zeal to repair the consequences of past neglect and identify each species by comparison with examples in a better state of preservation. It would have greatly increased the value of the work if, having so established their identity, the figures had been drawn from perfect, or at least from clean, representatives of the species. It is difficult to see what purpose is served by figures of insects almost destitute of legs and thickly coated with dirt, except as a warning to intending donors of valuable specimens to provincial museums, which can never maintain staffs of experts adequate for the proper preservation of natural objects of any and every kind. The due safeguarding of type specimens, as well as their availability to those specialists who need to make use of them, render desirable their concentration in as few, accessible, and well-staffed institutions as possible.

Parade of the Living : a History of Life on Earth. By JOHN HOGDON BRADLEY. Pp. xiv + 276. Text-illust. (London : George Routledge & Sons, Ltd. 1931. 10*s.* 6*d.*)

PUBLISHED by an English firm, and presenting a title-page on which there is no suggestion that the author is not English, the volume hardly prepares its reader for the transatlantic flavour which permeates its pages. A book is appraised for its matter, its manner, and its underlying thought. The matter, when translated into plain English, is seen to be a review of living beings as they have developed through the ages. The evolution of an environment; the relation of the living to the inorganic; the lowliest organisms; the higher invertebrates; fishes and the exploration of the land : amphibia and land-plants; dinosaurs, birds, mammals, primitive man; such, in plain language, are the subjects treated under such lurid headings as " A Ghost Walks," " The Anatomy of Hell," " Spawn of Necessity," and so on. The account is fairly accurate, but there are some surprises :—" Under each leaf [of *Lepidodendron*] were two rows of spores, through which the tree sucked carbon dioxide out of the air " (p. 74); " the bryozoans or moss animals, for millions of years during the early Palæozoic the chief reef-building animals . . . " (p. 95); " Like oysters we are males and females " [but fortunately not, like oysters, successively so]. " Like oysters the males are energetic, impetuous, daring, and combative " (p. 233). Even Lewis Carroll's oysters didn't come up to this.

So much for the matter : as for the manner, on p. 13 we read, " To attempt to describe life is to make ignorance flower in verbiage." Certainly the verbiage is here—listen to this. "The entrails of the young earth stirred frequently in nervous unrest. Vast quantities of ash and lava were spewed upon the surface through fissures and volcanic cones. Granite ulcers ate their way towards the outer crust. Occasionally respite was granted a portion of the surface, when quiet waves lapped quiet shores. But during most of the time over most of the earth, the demons of the underworld were bringing their hell to the surface. At some time during this era, nobody knows when, the day of days broke over a troubled world. At last the restless energy of nature was destined to take *shape, meaning was to rise from the blind struggle of physical forces.* Something stirred in the Archæan muck and the first creature emerged " (pp. 24, 25). Of course, if one likes this sort of writing there is no more to be said.

The author's philosophy does not appear to be a happy one. "We are puppets in the side show of the cosmic circus, creatures of chance, for chance built the show house and modelled the actors, and may some day destroy both " (p. 13). I suppose that the thought running through this book is best expressed on p. 265, " . . . all the qualities we esteem in man, the qualities that make life tolerable, are functions of the nervous system." I suppose, too, that accordingly as they hold, or do not hold, this opinion, men are more fundamentally divided than by any other criterion. To hold Dr. Bradley's view seems, to the reviewer, inevitably to annul, or at least to depreciate, the very qualities he cites.

W. D. LANG.

How Animals Live. By J. MOREWOOD DOWSETT, F.R.G.S., F.Z.S. Pp. 286, with 38 illustrations. (London: Hutchinson & Co., Ltd. 1931. 12*s.* 6*d.*)

IN this volume the author deals with many subjects to do with animals from an entirely fresh angle, and the chapters entitled " How animals play," " How animals work," " Passions," " Can animals reason ? " and " The social sense " contain much that is of interest. The illustrations, which are numerous, are on the whole good, especially those founded on photographs of the animals in their natural surroundings.

The opening chapter, entitled " Some general reflections," shows that the author is in sympathy with the activities of the various game reserves and national parks now in existence, although such information as is given concerning these sanctuaries is not quite up-to-date. Comparisons made between the working methods of man and animals are of considerable interest; stress is laid on the fact that some animals, like men, live from hand to mouth, while others store up for a rainy day. Some work alone, others work in teams, but no matter how they work their object in working is to gain the necessary food for the preservation of life. Mention is also made of the industrious habits of ants and bees, and such animals as the beaver are dealt with at considerable length; the author might also have drawn attention to the laborious and devastating habits of the musk-rat, an animal whose industrious habits are causing great havoc in central and western Europe.

The chapter on animal eccentricities deals with many cases of strange foster parents, and the strange antics of the gnu are considered as a form of temporary insanity. Cases of persecution of sick animals by their companions are here dealt with, and the migration of the lemming is also remarked upon as an eccentricity. Eccentric tastes in diet are also mentioned, and cases of cats and dogs that preferred strong drink to milk or water are recorded.

The photographic illustrations include one of an elephant about to charge with the trunk curled up in the manner characteristic of these animals when charging. There are also good photographs of rhinoceros and buffalo, and in the final chapter entitled " Conclusions " many interesting incidents relating to subjects as far apart as Mistinguette's legs and the migration of the Painted Lady are dealt with in detail.

A History of Fishes. By J. R. NORMAN. Illustrated by Lieut.-Col. W. P. C. Tenison. (London: Ernest Benn, Limited. 1931. 28*s.* net.)

IN one respect, at least, the scientific staff of the Museum should be well prepared for writing books on natural history that will appeal to the general reader. The daily stream of inquiries that they have to answer leaves them in no doubt as to the kind of information which the ordinary man is most likely to want. They also learn that there is a considerable and increasing section of the public prepared to understand, and ready to be interested in, the results of scientific research if these are presented to them with no more than the necessary minimum of technical language.

With these considerations in mind, Mr. J. R. Norman has written a " History of Fishes " that can be unreservedly commended to readers desirous of something better than the usual type of " popular " natural history. He discusses in turn the structure, physiology, life-history, and distribution of fishes; their conditions of life, geological history and importance to mankind, and the myths and legends that have gathered round them. He has brought together a vast amount of information and has set it forth in a very orderly and readable fashion. Covering as it does such a wide field, it will be surprising if the book is not found to contain here and there errors of fact or of interpretation. These, however, may be left for the discovery of specialists, and they are not likely to be very numerous or very serious.

An important part of the excellence of the book lies in the abundance and high quality of the illustrations. The text-figures, which are the work of Lieut.-Col. Tenison, are nearly all original and are admirably clear and well reproduced.

While it is pleasant to be able to praise the work of colleagues, one criticism must be directed not so much against Mr. Norman as against a prevalent fashion in biological writing. When, half a century ago, Dr. Günther published his " Introduction to the Study of Fishes," the greater part of his volume was taken up by a survey of the classification, order by order and family by family. A brief diagnosis of each systematic group was followed by a description of the more remarkable species contained in it, their singularities of structure and habits, their economic importance and the like. In other words, taxonomy supplied the scaffolding on which the book was built.

Now, Mr. Norman, attempting a very similar task, employs a very different scaffolding. The main theme of his chapters is the correlation of structure and function, of habit and environment. The new scaffolding is better than the old and the book becomes much more readable and interesting as well as more scientific. The subject of classification, however, is dismissed in a short chapter of seventeen pages, a great part of which is devoted to a hurried enumeration of families with only here and there an indication of the characters distinguishing them. It is as hard to read as, and much less informative than, a well-digested tabular synopsis would have been.

The fact is that we systematists are suffering from what, in current slang, is called an " inferiority complex." It has been dinned into us since our student days that taxonomy is a dismal and uninspiring subject, of no interest to anybody except museum curators and compilers of text-books. It is time that we carried the war into the enemy's country. There *is* a Systema Naturæ awaiting our discovery. Could we understand its significance, we should have uncovered one of the greater secrets of the Universe. W. T. C.

RECENT IMPORTANT ALTERATIONS AND ACQUISITIONS.

THE selection of specimens collected by Mr. Bertram Thomas (p. 112) having been removed from the Central Hall, the case is being used for an exhibit of Browniana to celebrate the centenary of the discovery of the nucleus of the cell by Robert Brown, firs Keeper of Botany (1827–1858) in the British Museum.

Special exhibits have been arranged in the Department of Geology: (1) Evolution; (2) Reptiles; (3) Internal Structure of Brachiopods; (4) Trends in Corals; (5) Problematic Fishes; (6) Early History of Fossils. The large fossil reptiles for so many years exhibited in the (recent) Reptile Gallery have been removed to Gallery VI of the Department of Geology.

A new wall-case, with internal lighting, has been placed in the Mineral Gallery for the display of large mineral specimens.

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Department of Zoology.

Skull and head-skin of an Abyssinian duikerbok, and the skin and skull of a young male Menelik's bushbuck; presented by H.R.H. the Duke of Gloucester.

Complete male and female specimens of the Indian lion; presented by H.H. the Nawab Sahib of Junagadh.

95 Heads and skulls of Asiatic and American ungulates and carnivora selected from the collection of the late C. St. George Littledale; bequeathed.

A large number of skulls of ungulates and lions shot by the late Hereward Dollman in Northern Rhodesia, and a very complete collection of British birds' eggs and nests; presented by Mr. J. C. Dollman.

Skin and skeleton of the Sumatran rhinoceros, shot by Mr. E. H. Peacock in the Shwe-u-daung Forest Reserve, Upper Burma; presented by the Government of Burma.

Skins of a leopard and a tiger from northern India, and the skin and skull of a Red bear from Tehri Garwhal; presented by Major G. Burrard, D.S.O.

A large number of photographs of the home of the Eastern gorilla, the Birunga Mountain district, east-central Africa, taken by the donor; presented by Mr. Marius Maxwell.

About 300 sea-urchins, mainly from the West Indies; presented by Dr. R. T. Jackson.

A large collection of mammals (including three abnormal elephant tusks) made mainly by Mr. J. Jardine; presented by the Game Department of Ugandi.

Skeleton of the extinct Giant Tortoise of Charles Island, Galapagos; presented by the New York Zoological Society.

A large collection, including representatives of nearly all the chief groups of marine and terrestrial invertebrates and vertebrates, obtained in the West Indies by Captain A. K. Totton, M.C., while with the Atlantic Fleet.

A mounted specimen of Pigmy Hippopotamus from the French Ivory Coast; purchased.

A valuable collection of West African birds, principally from the highlands of north-eastern Sierra Leone and the adjoining French territory, formed by Mr. G. L. Bates; purchased.

A mounted specimen of a Red Uakari monkey; purchased.

A collection of 96 mammals (including some interesting monkeys, bats, and rodents) from Rio Napo, Ecuador; purchased.

A small collection (including female specimens of the Yellow-backed, White-bellied, and Blue duikers, specimens of two species of guenon, a Palm civet, and a Brush-tailed porcupine) from the Cameroons; purchased.

Department of Entomology.

Collection formed in the West Indies by Captain A. K. Totton, M.C., while with the Atlantic Fleet.

Series of insects of various orders collected by the donor in Brazil and Peru; presented by Rev. A. Miles Moss.

Collection, numbering about 60,000 specimens from all parts of the world, of Hesperiidæ (Skipper Butterflies) formed by the late Monsieur René Oberthür; purchased.

Department of Geology.

Four specimens of the primitive ichthyosaur, *Mixosaurus*, collected by the donor at Edge Island during an expedition to Spitsbergen in 1927; presented by Mr. N. L. Falcon through the Sedgwick Museum, Cambridge.

A tooth of the elephant *Mastodon arvernensis*, from the Red Crag of Suffolk; presented by Mrs. I. S. Critten.

Fishes from the Eocene strata of northern Italy; purchased.

Jurassic insects from the lithographic stone at Solenhofen, Bavaria; purchased.

Triassic fishes from near Sydney, Australia; purchased.

Department of Mineralogy.

Diamond crystal, showing inclusions of quartz, from Diamantina, and a slice of the meteoric iron from Cratheus, Brazil; presented by Dr. Djalma Guimarães.

Gold, rock-crystal, and other minerals from Morro Velho gold mine, Minas Geraes, Brazil; presented by the St. John del Rey Mining Company.

Crystallized minerals, including fine groups of rock-crystal and gold in quartz, from Morro Velho gold mine, Minas Geraes, Brazil; presented by Mrs. E. J. McCall.

Crystals of cooperite and platinum from Bushveld, Transvaal; presented by the Potgietersrust Platinum Company.

Specimen of the rare mineral dawsonite, from Albania; presented by Baron F. Nopcsa.

Coloured cast of the meteoric stone, weighing 250 lb., which fell on December 24, 1858, at Molina, Murcia, Spain; presented by the Museo Nacional de Ciencias Naturales, Madrid.

Two small diamonds, the first found in Sierra Leone; presented by H.E. the Governor of Sierra Leone.

Glass models of diamond crystals, which had been passed off in South Africa as genuine; presented by Mr. E. G. Bryant.

Piece of an unusual type of stony meteorite, which was seen to fall on November 25, 1930, at Karoonda, South Australia; presented by Prof. Kerr Grant.

Bolivian minerals, including a piece of fossil bone impregnated by tin ore; presented by Chief Inspector E. Nicholls.

Calcite as mauve-coloured crystals from Shropshire, pumice found floating on the sea after the eruption of Krakatoa, East Indies, in 1883, and other specimens; presented by Captain J. M. Naylor.

A large block of blomstrandine froma new occurrence in Norway; exchanged.

A fragment of one of the twelve meteoric stones which fell on February 9, 1929, in Lithuania; exchanged.

Slice of the new meteoric iron found at Nativitas, Tlaxcala, Mexico; purchased.

Slice of the new meteoric stone found at Covert, Kansas, U.S.A.; purchased.

Slice of the new meteoric stone found in Adams County, Colorado, U.S.A.; purchased.

A mass of meteoric iron, weighing 125 lb., found in 1922 at Piedade do Bagre, Minas Geraes, Brazil; purchased.

A large crystal of hæmatite and a fine group of crystals from the iron mines of Elba; purchased.

Faceted diopside from the Ruby mines, Upper Burma; purchased.

Department of Botany.

673 dried plants from Nepal, collected by Captain Lall Dhevoj and presented to H.M. the King by Major-General H. H. Maharaja Sir Bhim Shumshere Jung Bahadur, K.C.S.I., K.C.V.O., Prime Minister and Marshal of Nepal; loaned by H.M. the King.

Fern herbarium, about 3000 specimens, belonging to the late Mr. R. V. Sherring; presented by the trustees of the late Mr. R. V. Sherring.

Collection of British and foreign mosses formed by the late Sir James Stirling; presented by the Tunbridge Wells Municipal Museum.

Two specimens and photographs of "Coco de Mer"; presented by Miss Royston.

A small collection of New Zealand plants; presented by Dr. H. H. Allan.

A fine series of the rust fungus, *Coleosporium Solidaginis*; presented by the Department of Agriculture, U.S.A.

646 drawings of fungi, lichens, and mycetozoa made by John Templeton (1766–1825), a well-known Irish botanist; presented by Miss A. Lorrain Smith.

58 microscopic slides, mainly of freshwater algæ, prepared by Pfeiffer von Wellheim; purchased.

400 specimens collected by Prof. J. Bornmuller in Asia Minor and Persia; purchased.

Library.

A copy of Robert John Thornton's rare work, "Botanical Extracts, or the Philosophy of Botany," in four volumes (London, 1798–1810); presented by the Friends of the National Libraries with the co-operation of Mr. B. H. Soulsby.

207 original drawings, in three large folio volumes, formerly belonging to the donor's brother, the late Sir Charles Cust; presented by Miss Ursula Cust.

A collection of about 2600 letters addressed to William Phillips; presented by Mr. J. Ramsbottom, O.B.E.

STAFF NEWS.

THE Principal Trustees have appointed Mr. Alfred Weston McKenny Hughes and Mr. Leslie Bairstow to Assistant Keeperships (Second Class) in the Departments of Entomology and Geology respectively.

Mr. McKenny Hughes was educated at Eton and Trinity College, Cambridge, and served during the War with the Royal Field Artillery and in the Royal Air Force. He was entomologist to the John Innes Horticultural Institution, Merton Park, from 1927 to the date of his appointment to the Museum.

Mr. Bairstow was educated at Ackworth School; Bootham School, York; and King's College, Cambridge. He obtained a first class in Parts I and II of the Natural Sciences Tripos (1927 and 1928). He was awarded by King's College the Cooke Prize in 1926, the Vintner Scholarship in 1927, a Harold Fry Studentship and a Richards Prize in 1928, and the Reginald John Smith Studentship in 1930. In 1929 he was elected by the University of Cambridge to the Harkness Scholarship.

* * * *

Louis Westenra Sambon, who died with tragic suddenness on August 31 last while on a visit to Paris, had for many years been a constant visitor to the Museum for the purpose of study and was well known to the Staff. Born at Milan on November 7, 1865, his father being Italian but his mother English, he was educated both in England and abroad, and graduated M.D. at Naples. He saw war service with the Italian army in Abyssinia, but most of his life was devoted to research in the obscurer problems of medicine. For many years he worked with Sir Patrick Manson at the London School of Tropical Medicine. His father was one of Garibaldi's famous thousand volunteers.

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A SUMMER AT THE DRY TORTUGAS LABORATORY, FLORIDA.

By GEOFFREY TANDY, B.A., Assistant Keeper, Department of Botany.

IN 1928 an expedition was made to the Great Barrier Reef of Australia to study the biology of coral reefs, and during the course of this work certain investigational methods were devised by the shore-party of the expedition. After some of the results obtained by these methods had been published, an opportunity of testing them in another area was offered by the Carnegie Institution of Washington to Dr. T. A. Stephenson. Dr. Stephenson, however, was unable to take advantage of the opportunity owing to his appointment to the Chair of Zoology at Cape Town, and eventually Mr. J. S. Colman and I sailed for Florida on May 22nd and arrived at Key West on June 2nd.

FIG. 1.—MR. GEOFFREY TANDY, HOLDING BARRACUDAS.

The Dry Tortugas are a group of islands in the Gulf of Mexico, in 24° 40′ N. lat. and 82° 50′ W. long. There are seven Keys above the high-water line on the site of an ancient atoll, which has a large elliptical shape on the six-fathom line. The line of the old atoll shows a blunt nose on the north-east, tailing away from the direction of the prevailing wind. The atoll is traversed by a deep-water channel running from north-west to south-east, and is also entered by another channel from the south-west. Bird Key, Garden Key, Long Key, and Bush Key are shown on the chart and form one group on the south-east, and are separated by the south-east channel from Sand Key, Middle Key, and East Key. Loggerhead Key, the largest, on which the laboratory stands, lies to the south-west, and is separated by the south-west channel from the first group of Keys.

We had decided long before starting on the expedition that we should spend our time most profitably by making certain of a biological and topographical survey of any reef area which seemed suitable. We therefore made a preliminary survey of the territory available in order to select a suitable area which could be compared with the Australian reefs. This we found in the places named on the charts as Long Key and Bush Key.

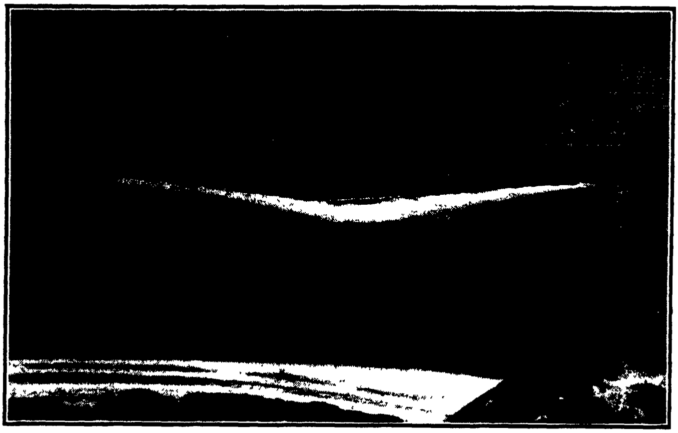

FIG. 2.—LONG-BUSH KEY.

FIG. 3.—ARCHING ROOTS OF MANGROVES.

These to-day are one and the unit may conveniently be called Long-Bush Key (Fig. 2). The photograph is an instructive one. It was taken from Fort Jefferson on Loggerhead Key looking in

FIG. 4.—LITTORAL DUNE FORMATION.

FIG. 5.—MANGROVES.

an easterly direction. The fan-tail shape is well shown, and is conditioned by the prevailing north-east wind. The shoal is seen in the middle foreground, and surrounding the Key is the characteristic littoral zone of sand. The dark mass is the vegetation that is always found in such localities—*Tournefortia*, *Ipomœa*, *Uniola*, and *Suriana*, the bay cedar.

One of the main parts of our work was to study the succession of organisms on clean surfaces. To this end we had made three dozen cubes of concrete of three parts sand and one of cement of 15 cm. side. These were put out in four groups of nine each, so that each week one might be brought from each

FIG. 6.—MANGROVE, *Avicennia nitida*, SHOWING "BREATHING-ROOTS."

FIG. 7.—MANGROVE SEEDLINGS INSIDE SHINGLE RAMPART ON LONG-BUSH KEY.

group, and a census made of its population. The details of this work must be published elsewhere, but it may be observed that, considered purely from the point of view of the adequate representation of the fauna and flora of the West Indies in the Museum collections, the methods were remarkably fruitful.

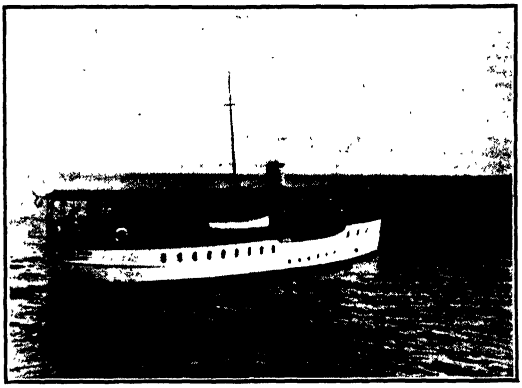

FIG. 8.—LABORATORY YACHT "ANTON DOHRN."

By losing no time anywhere, we were on the railway among the Florida Keys in the forenoon of June 2nd, and saw with considerable, if not very comprehensible, pleasure, the arching roots of mangroves again (Fig. 3). We knew well enough that we were distant from our friends of three years ago by the Gulf of Mexico, Central America, and all the Pacific Ocean; that the species were mostly different and that the coconut palm and the *Casuarina* were introductions. Nevertheless, it is not difficult to believe that the fascination of the tropics begins with a few plants.

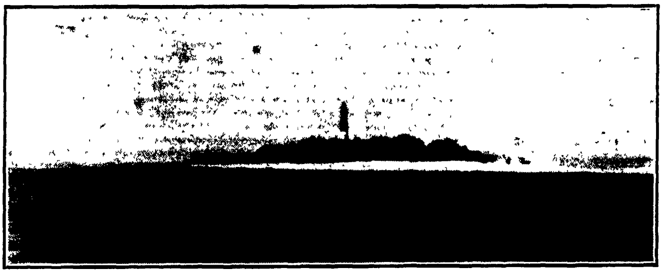

FIG. 9.—LOGGERHEAD KEY.

Mangroves of various kinds are characteristic plants of some of the Florida Keys and the neighbouring coasts. Boca Grande is an island between Key West and the Marquesas, and the littoral dune formation here is of grass with a backing of mangrove swamp as shown in Fig. 4. Similarly in the Marquesas, mangroves (Fig. 5) again dominate the scenery. In the Marquesas, in many places the interesting "breathing-roots" of the mangrove, *Avicennia,* were seen (Fig. 6). In all these badly-aerated substrata the roots have some adaptation for getting oxygen. *Avicennia nitida* develops a miniature forest of erect pneumatophores and a great deal of mud is therefore consolidated among them. While on the subject of mangroves, a word on the germination of their seeds may not be out of place, as the germination of the seeds of various species of mangrove while still attached to the parent plant (so-called " vivipary ") is perhaps not too well realized. The Rhizophoraceæ produce an elongated hypocotyl, which is adapted to float upright if it fall into water or plant itself in mud like a dart. *Rhizophora* *mangle* in the Tortugas exhibits the same habit as the allied *R. mucronata* in Australia; that of forming a line on the inside of a shingle rampart, as is shown in Fig. 7, where mangrove seedlings may be seen in that situation on Long-Bush Key.

FIG. 10.—BEACH ROCK AT LOGGERHEAD KEY.

The Laboratory yacht " Anton Dohrn " (Fig. 8), a sturdy 75-foot motor-vessel, was nearly ready to sail when we arrived at Key West. She needed only a few tons of ice and her complement of investigators, and, having acquired these, she sailed for the Dry Tortugas at 6 o'clock on the morning of the 3rd, and arrived at Loggerhead Key (Fig. 9) in the early afternoon. The lighthouse, shown in the photograph, is about 150 feet high (the light is officially 151 feet high), and is very stoutly built to withstand the hurricanes for which the region has an ill name.

FIG. 11.—LOGGERHEAD KEY, FROM THE LIGHTHOUSE.

FIG. 12.—SAND-FLORA ON LOGGERHEAD KEY.

FIG. 13.—REMAINS OF FORT JEFFERSON ON GARDEN KEY.

FIG. 14.—DERELICT LIGHTHOUSE AT FORT JEFFERSON.

It is reported that after one such "blow" all sorts of flotsam were removed from the lantern. However, the laboratory season does not coincide with that of the hurricanes, so we had no demonstration of this. The dark mass of vegetation and the bare zone of sand and shingle can be seen.

The beach rock at Loggerhead Key (Fig. 10) exhibited a very marked zonation of organisms in relation to tide-levels. It is a common statement that this zonation is found only in temperate waters, but the lines of the low and high waters of the spring and neap tides respectively were reasonably clearly marked by four zones of organisms. Some impression of the general vegetation may be gained from Fig. 11, which shows a general view of the Key taken from the Lighthouse, looking in a north-north-east direction. The Laboratory buildings and the Pier, at which the yacht "Anton Dohrn" is moored, can be seen at the far end. In the foreground are some coconut palms, while the dark mass forming the main part of the picture is the sand-flora, dotted with an occasional agave. The sand-flora, which is seen in more detail in Fig. 12, is not perhaps very impressive. It is chiefly a close mat of various grasses, the roots of which have doubtless a sand-binding function and so contribute towards the ultimate formation of humus, upon which larger plants can become established.

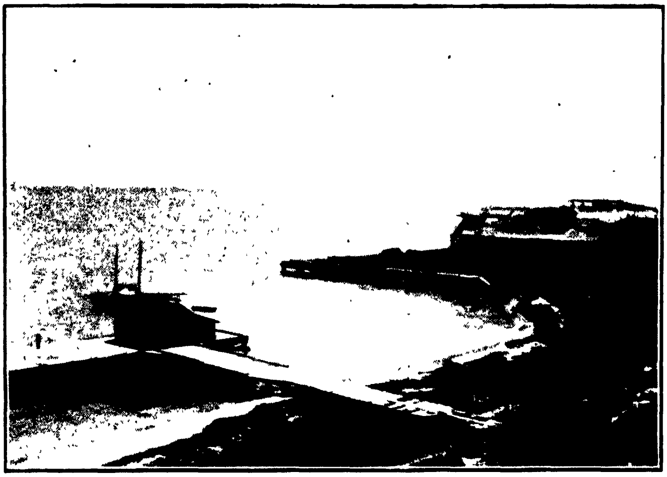

FIG. 15.—WHARVES WITH COAL-SHEDS, DAMAGED BY HURRICANE, AT FORT JEFFERSON.

The Dry Tortugas as a group of islands are interesting. Stevenson mentions them in "Treasure Island," and doubtless they have given convenient shelter to pirates, buccaneers, and other interesting characters. On one of them—Garden Key—stand the remains of old Fort Jefferson, a grim, solid structure in red brick, a view of which is seen in Fig. 13, taken from the deck of a wrecked schooner. It is now peaceful enough: indeed, its guns were never in action. Nevertheless, it has a history of some terror in that yellow fever killed off the members of its garrison by the hundred before the blame was rightly laid at the door of a mosquito. John Wilkes Booth, the assassin of Abraham Lincoln, had his leg set by a certain Dr. Mudd, who was in due course indicted for complicity. He was sent to Fort Jefferson to serve his sentence and eventually, the officers having died of yellow fever, took command and handled the situation with considerable success. The photographs in Figs. 14 and 15 show Fort Jefferson. The lighthouse in Fig. 14 is now derelict, and the names painted on the side are names of ships that have visited the locality. Mention was made previously of the hurricanes which visit the district. An effect of one of these is shown in Fig. 15, which shows some damaged coal-sheds among the wharves at Fort Jefferson.

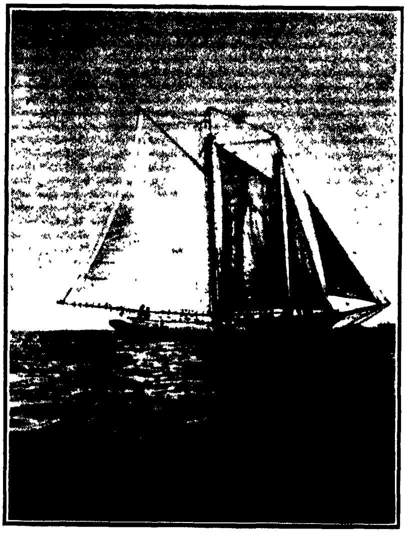

Fig. 16.—Havana Fishing Schooner.

Fig. 17.—Capture of a Big Shark.

The islands are still, in defiance of various regulations to the contrary, a resort of the Havana fishing schooners (Fig. 16). Very few of these craft have auxiliary engines and, to anyone interested, their clever manœuvring in narrow waters is well worth watching. Garden Key harbour is a quiet anchorage, the tanks of the deserted Fort supply water which is not too brackish to drink, and there is good fishing all around. It is the practice to keep the fish alive in a large well amidships.

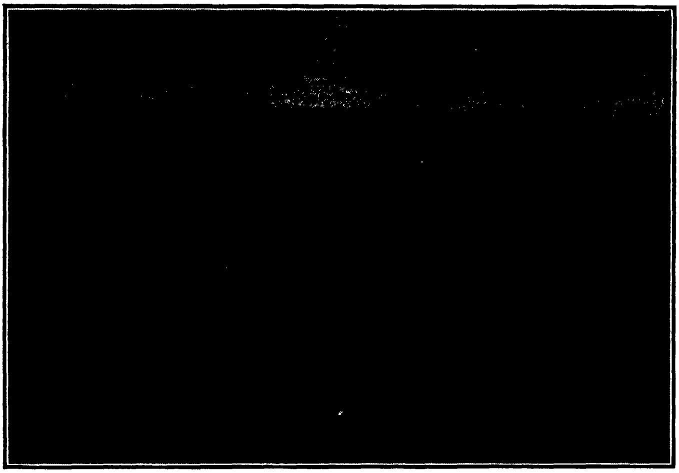

Fig. 18.—Whale, stranded on Long-Bush Key.

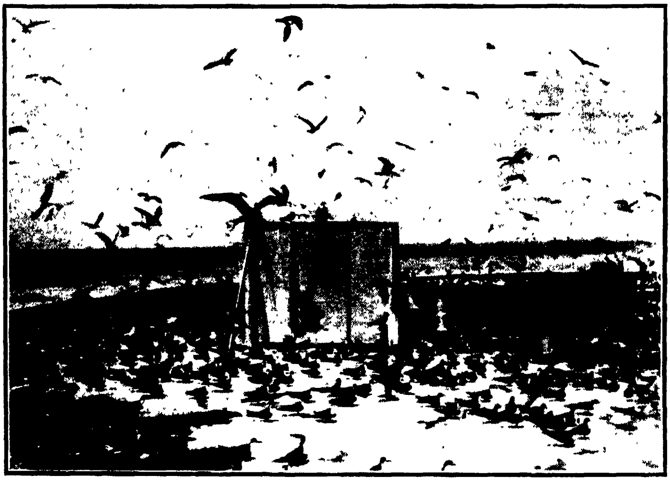

Fig. 19.—Bird Life on Bird Key.

The sides of the well are full of holes, and so give direct communication with the sea outside.

The fish fauna of the area is large and varied. Sharks are common, although nobody seemed to be greatly afraid of them, in spite of the fact that under-sea work in the diving-hood was an almost daily occurrence for somebody. The capture of a big fellow (Fig. 17), with a truly appalling equipment of teeth, was a reminder that not all the fish in those waters are harmless. Nevertheless, the barracuda is much more feared than the shark. He is ferocious, curious, swift, and usually hungry. He has never attacked anyone at the Tortugas Laboratory, but it is far from certain that he never will. He is, from the angler's point of view, a sporting fish and will break surface in the best spectacular fashion. Occasional excitement was caused by the arrival of even larger beasts. At one time a school of nine small whales, known locally as blackfish (*Globicephala* sp.), were stranded on the shores of Long-Bush Key.

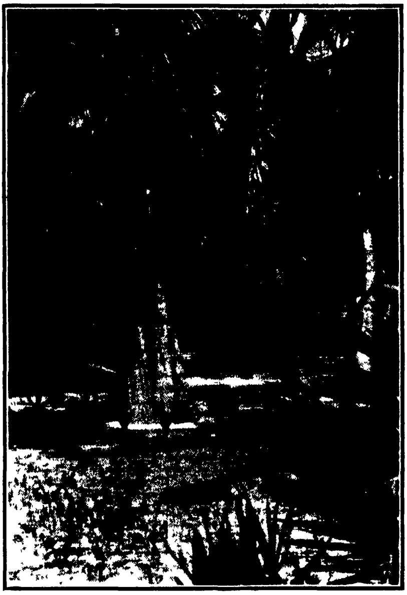

FIG. 20.—MEMORIAL TO ALFRED G. MAYOR, FIRST DIRECTOR OF THE TORTUGAS LABORATORY.

Bird Key is now considerably reduced from its former size. Photographs taken fifteen years ago show it as well vegetated and having a cottage for the bird warden. The vegetation this year was reduced to a few creeping plants, but there were still thousands of birds (Fig. 19). The large bird with outstretched wings on the left of the board is a frigate-bird. It is most astonishing that these birds, mainly sooty terns, come to this one spot, year after year, to rear their families, and will even find their way back, if taken hundreds of miles north on a steamer.

The Tortugas Laboratory was established more than twenty years ago, largely owing to the enthusiasm and energy of its first Director, Alfred G. Mayor. In the little quadrangle formed by the Laboratory buildings is a simple memorial to him (Fig. 20). The present Director, Dr. W. H. Longley, has been associated with the venture from its very early days. It is therefore less surprising, though not less wonderful, that the Laboratory, which is closed from August to May, is a going concern as soon as it is opened.

"FOUR-TUSKED" ELEPHANTS

By J. G. Dollman, B.A., Assistant Keeper, Department of Zoology.

In 1919 there appeared in the *Sudan Notes and Records* (Vol. 2, p. 231) an account by Abd el Farag Ali, an Egyptian officer, of an elephant which he observed on May 18, 1917, when out shooting in the District of Sheikh Ako Mangara on the borders between Tembura and Yambio Districts in the Sudan. He states in this article that he saw an elephant which carried four tusks, all apparently projecting from the upper jaw, and as the animal was only fifteen yards away it was possible to make careful note of this peculiarity. It was noted that the tusks on the left side consisted of one fairly large normally developed tooth projecting forwards in the normal manner, and one smaller tusk, about 2½ inches in diameter, arising from underneath the large one and bent sharply downwards. On the right side the main tusk was inclined downwards, in a sort of Dinotherium-like manner, while the smaller tusk emerged, as on the left side, from underneath the large downwardly curved tusk, and projected forwards in more or less the usual manner.

From this description one was at first led to assume that these supernumerary tusks might have been milk-incisors that had persisted and been retained, side by side, with the permanent teeth, throughout the animal's life. As the result of certain recent discoveries in connexion with abnormalities in the development of the Proboscidean incisors, it becomes necessary to reconsider this view, and remembering that there is no definite evidence that the milk-incisors ever persist throughout life in the elephant, and taking into consideration the size of the teeth in this specimen, one is forced to look for another explanation of the abnormality.

Some seven years after the publication of the above article on the Yambio four-tusked elephant the whole question of the existence of such animals was brought to the notice of the general public by a letter from Capt. Tracy Philipps in *The Times* of January 13, 1926, in which he states that, when visiting the Lower Welle-river District in the Belgian Congo in 1921, he first heard about four-tusked elephants from some Azande and BaKango natives. In 1925 Capt. Philipps was again in the Azande country, and he stayed a night with the Vongara-Zande Sultan Ngilima. The latter described how some years previously he had killed a four-tusked elephant, and not considering the animal of any importance he had traded the ivory to a Greek merchant. Capt. Philipps reports how in June of that year he was on the Congo–Nile Divide and came across a small herd of elephants. It was noted that there was one very large animal in the herd, but owing to the elephants having winded the hunting party the animals turned and stampeded back towards the Congo side. One of the men on the flank of the party was enabled to observe this large elephant more closely than the rest of the trackers; he pronounced it to be a " siyamma," and in consequence of its presence the natives imagined that the herd would be very aggressive.

Now " siyamma " was the name used by the Sultan Ngilima and the Azande in describing the four-tusked elephants, and thus it appeared probable that the large animal Capt. Philipps caught a glimpse of was a four-tusker. About 25 inches was given as the average length of these supernumerary tusks: in some cases they were stated to be close but separate growths from the root. In others they appeared to be solid but separated excrescences on the main tusks; the latter were, it is stated, described by the natives as being invariably exceptionally large. This latter statement is not surprising; any native report concerning the size of an animal or its tusks may be taken for granted to be an exaggerated estimate, at least in 99 cases out of every 100. Capt. Philipps closes his letter with the suggestion that " the four-tuskers of the Welle-Shari may be rarely recurrent types, and something more than accidental freaks of nature."

This letter was followed by another from the same writer on January 21, 1926, in which he drew attention to the Yambio specimen mentioned above as having been observed by an Egyptian officer in 1917. Capt. Philipps pointed out that, although it was possible to account for the abnormal condition of one of the incisors as being caused by a split at the base of the tusk through accident, resulting in the growth of two malformed tusks, it was extremely unlikely that this should be the case with both incisor teeth in one and the same animal. Apart from the possibility of injury or disease, such an abnormality might arise from dichotomy of the tooth germ or it might possibly be a case of an accessory tooth germ being developed.

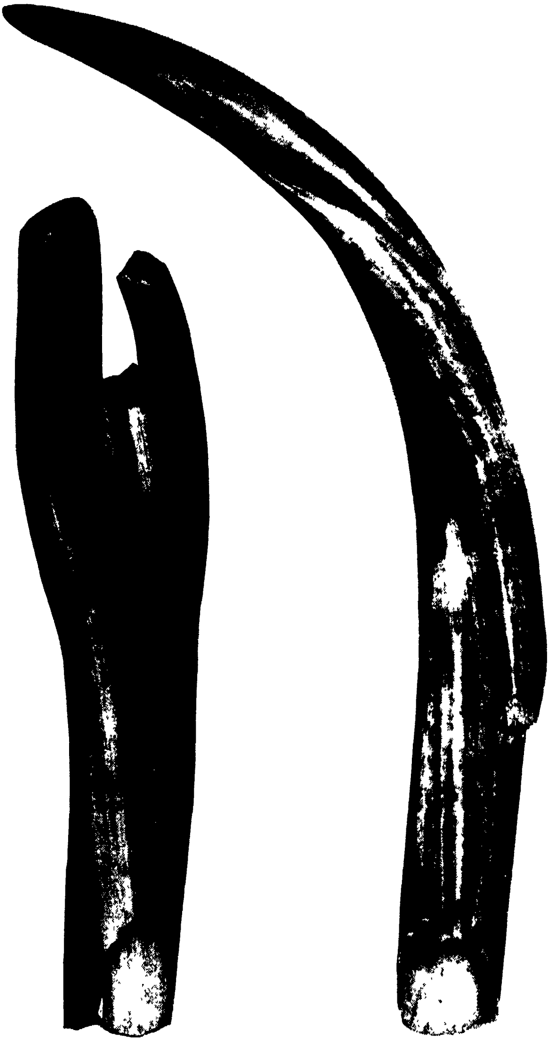

FIG. 1.—ABNORMAL ELEPHANT TUSKS FROM UGANDA (LEFT) AND THE SUDAN (RIGHT).

On January 22 of the same year (1926) there appeared a letter in *The Times* from Dr. R. T. Gunther, of Oxford, who stated that for many years he used to demonstrate the possibility of a four-tusked elephant to his pupils by exhibiting a large double tusk, each half of which was apparently fully grown and about 4 inches in diameter with a separate pulp cavity. This specimen is now in the Museum of the Royal College of Surgeons.

After this correspondence had appeared, Capt. Phillips wrote another letter concerning a three-tusked elephant observed by Mr. Gilbert Bussey, who had just returned from a shooting trip in the Congo. Mr. Bussey stated that he had received reports of several four-tusked elephants, and he had, in addition, actually seen the skull of a three-tusker at Dungu, the two tusks in one socket being quite separate. This animal was a female, and the tusks weighed about 8 lb. each. In 1928 it was reported that this three-tusked cow elephant skull had been preserved and sent to the Musée du Congo Belge near Brussels and that the animal had been shot by the Sultan of Zande.

Dr. Cuthbert Christy then took part in the discussion and, after stating that in spite of having travelled extensively in the Zande country he had never seen or heard of a four-tusked elephant, refers to these animals as " teratological monstrosities " and " quadricorns."

In 1926 Major Holland presented the Museum with a very interesting tusk from the Sudan. This tusk bears a supernumerary root along one side near the base, and this root is continued upwards towards the apex, almost as a separate member, coalescing with the main shaft some distance from the tip. This tusk, which is the right-hand specimen in Fig. 1, may be looked upon as a mild example of the condition which results in the formation of supernumerary tusks.

About a couple of months ago the Museum received from the Game Department of Uganda three very interesting abnormal tusks, which had been collected by Mr. J. Jardine. These tusks are here figured for the first time; the left-hand figure (Fig. 1) is from a photograph of one of the tusks, that of a bull elephant from the Budonga forest in the Bunyoro district of Uganda, and the other two, those of a female from the Bugoma forest, Bunyoro, are depicted in Fig. 2. Of the latter the tusk figured on the right has five roots which are, for the greater part of their length, joined together; at the tip these semi-individual members fuse together to form the main shaft of the tusk.

It appears that, from some cause unknown, the soft growing tissues at the base of the tooth have been forced to assume an ever-increasingly ridged appearance. This condition seems to have persisted long enough for the depressions between the ridges to become sufficiently deep to separate some of them from the main stock, and in this way it is possible that the individual elements were formed.

In the left-hand tusk (Fig. 2) the same sort of condition exists, but in this case the abnormality is still more marked, for here the individual units are free at their tips. Thus instead of a single tusk terminating in a pointed apex, there are four small "tusklets" grouped together and arising from one alveolar socket. It is difficult to imagine how the trouble, which appears to have arisen at the base of the tooth, could have spread to its apex in this manner. On careful examination of these four tusklets, although they appear more or less individually distinct in the basal region, they seem to conform to a common apical outline at the tips, and appear in this region to have been split asunder by the pressure exerted by the ingrowing walls of the alveolar tissues below. This pressure would appear to be sufficiently great at the outset of the trouble to cause the shaft of the tooth to become grooved. The ingrowing bone then forces itself in between the grooves, thus forming two or more separate elements, and finally, in rare cases such as the present one, the amount of bony growth developed at the base, among

Fig. 2.—Abnormal Tusks of Female Elephant from Uganda.

the newly-formed separate elements, is so great that the tooth splits at the top into a corresponding number of units. This process appears to be rather like what happens when a log is split by hammering a wedge into its base. The tips of the four tusklets would seem to support this theory, as they are clearly parts of the apex of the parent tusk. The male tusk (Fig. 1, left) is also split into four sections; in this case, however, the entire tusk has been spirally twisted.

In 1891 the Museum received two abnormal tusks, which are very similar to these Uganda specimens. They are entered in the Register as coming from Zanzibar; but, as "Zanzibar" at that date meant any part of east or east-central Africa, the information is not of much value. One of these tusks is simply a multi-rooted club-headed tooth which exhibits no traces of apical division. The other one, a photograph of which is here given (Fig. 3, left), has the main body of the tusk split up into five different parts very much in the same manner as the multiple tusk described above.

East Africa would seem to be the principal home of these abnormalities, there being very few records of such multiple tusks from any other part of the continent. The Museum possesses one tusk (Fig. 3, right) which is labelled as coming from West Africa; but, as it was registered in the year 1865, it is possible that this information cannot be relied upon. There is one South African record in Chapman's "Travels in the Interior of South Africa," the specimen having had five tusks

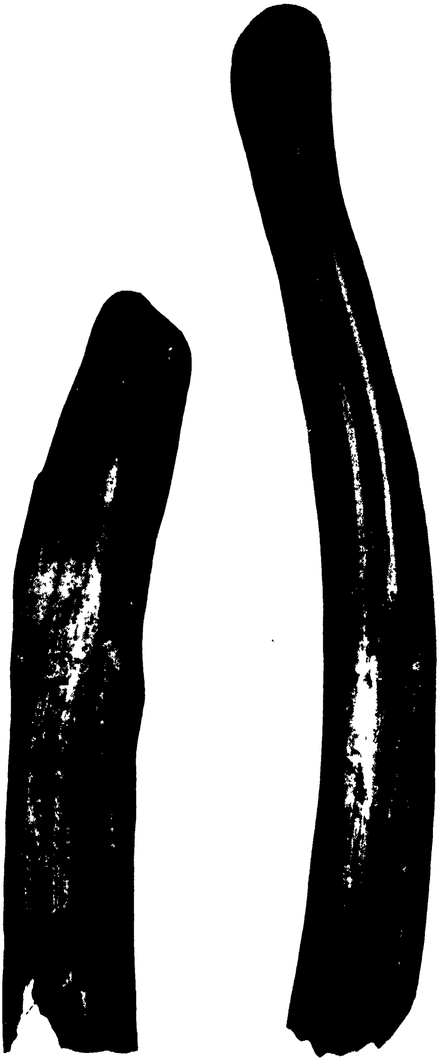

FIG. 3.—ABNORMAL ELEPHANT TUSKS FROM EAST (LEFT) AND WEST (RIGHT) AFRICA.

on one side and four on the other. It is an astonishing fact that there are not more South African cases recorded, considering the many thousands of elephants which were slaughtered during the last century in the country south of the Zambesi.

In connexion with these malformed tusks an interesting paper from the pen of Sir Frank Colyer was published in November of last year in the *Journal of the Bombay Natural History Society*. In this communication the author deals largely with the multiple tusks of Indian elephants, and figures are published of a multiple tusk of a "rogue" Indian elephant, which was composed of seven small tusks, six of which are shown in the photographs. Many cases of multiple tusks are mentioned and figures are given of the multiple tusk in its various stages of development. Sir Frank expresses the opinion that the double tusk is perhaps sometimes due to dichotomy of the tooth germ, and a photograph is given of a specimen in the Royal College of Surgeons, which appears to show the early stages of the formation of a double tusk, the sides of the tusk being deeply grooved. Double tusks arising from accessory tooth germs are discussed in this paper and cases mentioned in which this was probably the cause of the malformation. Many instances of these abnormalities are, Sir Frank thinks, due to trauma, and figures are given showing injured tusks that have developed into multiple specimens. The opinion is expressed that the formation of subsidiary tusks when due to injury would seem to follow a blow which causes the tusk to split in a longitudinal direction. In some cases in which the tusk is split longitudinally, necrosis of some of the fragments follows, and perhaps only a single portion of the tusk recovers. We cannot, however, assume that all these abnormal tusks are abnormal as a result of injury; there may be some pathological reason for these strange malformations.

Elephants may injure their tusks in a variety of ways, quite apart from the injurious effects of modern bullets. Animals with one tusk broken off are not uncommon, especially in bush country. Such damage, however, can scarcely be attributed to the effects of fighting among themselves, as it is rare to meet an elephant showing any traces of tusk wounds. The damage is much more probably the outcome of a habit these animals have of using their tusks to prize up the roots of trees when felling them to get at their foliage.

It should be remembered that an elephant's tusks are not the canine teeth as they are in warthogs and walruses. One of the reasons for regarding these teeth as canines is that they are embedded in the maxillæ instead of the premaxillæ in the adult state; this view gains no support from the true facts of the case. The tusks originally develop in the premaxilæ like ordinary incisors, and in these bones are situated their primitive alveoli. As growth proceeds, however, and the tusks get larger and heavier, in order to find suitable alveolar emplacement it becomes necessary for the tusks to seek firmer foundation. To this end they are forced to sink through the premaxillæ and come to rest in the specially modified alveolar processes of the maxillæ. This does not, of course, interfere with the relationship which these teeth bear to the incisors of other mammals, the homology remains; very much the same sort of thing is met with in the rodents.

The incisor teeth of the Proboscidea consist of evergrowing teeth of great size: in modern types these incisor teeth are limited to a single pair in the upper jaw, but in the fossil forms such as Mœritherium, Palæomastodon, and Tetrabelodon we find the number of incisors increasing with the age of the deposit in which the fossils are found. Thus the later forms, as represented by some species of Tetrabelodon, have a single pair of tusks in each jaw, whereas the earliest known form Mœritherium from the Fayum has a full set of incisor teeth, the third upper incisors being slightly enlarged and foreshadowing the development of the modern elephant's tusk. The tusks of an elephant are composed mainly of solid dentine, that is, the ivory of commerce, and in the existing species the enamel covering is confined to the extreme tip.

The whole subject of these four-tusked elephants has recently been revived in the columns of *The Times*, and the correspondence has already resulted in the addition of one specimen of an abnormal tusk to the National Collection. Mr. W. A. Bowring, of Gibraltar, has sent to the Museum as a donation a single tusklet from one of these multiple-tusked elephants. It came from an animal shot twenty-five years ago in Uganda and is one of seven tusklets from one socket. It is to be hoped that the example of Mr. Bowring will be followed by others who may have in their possession specimens of abnormal ivory either from Africa or from India.

THE FOSSIL TREE TRUNK IN THE GROUNDS OF THE BRITISH MUSEUM (NATURAL HISTORY).

By W. N. Edwards, B.A., Deputy Keeper, Department of Geology.

Open-air museums, which are now so characteristic a feature in many European countries, have not so far been established in England, nor is there anywhere, so far as I know, an open-air geological museum, although so many rocks and fossils could very well be displayed out of doors. There are, of course, some specially protected geological features in national parks and reservations—in these islands the lepidodendroid stumps in the Victoria Park, Glasgow, may be mentioned—while some American museums have provided descriptive labels for " trail-side exhibits " in the country. Otherwise, only isolated specimens are to be found in museum grounds; in the gardens of the Natural History Museum—which unfortunately are not large enough for an extension of this method of display—the only exhibits are the large tree trunk with a piece of associated rock, in the eastern part of the gardens near Exhibition Road, and the sarsen stone, in the same enclosure, which was found in digging the foundations of the Victoria and Albert Museum.

The tree trunk is of great geological antiquity, having been found at Craigleith Quarry, Edinburgh, in the Calciferous Sandstone, which is of Lower Carboniferous age—earlier, that is, than the Coal Measures of this country. The tree is called *Pitys withami* (Lindley and Hutton), and belongs to a small group of entirely extinct plants which are still very imperfectly known. Much has been found out concerning the habit and structure of Carboniferous plants, so that approximate restorations of many of them are now quite familiar, but *Pitys* itself, although discovered as long ago as 1826, remains somewhat of a mystery. The foliage is believed to have been tapering and pointed, something like stout pine-needles, but this recent discovery, by Prof. W. T. Gordon, has not yet been fully published. Dr. D. H. Scott, writing in 1924 in " Extinct Plants and Problems of Evolution," says: " It is evident that the *Pitys* family constituted a distinct race, quite separate from the Upper Carboniferous Cordaiteans. Unfortunately, we know nothing of the fructification; from the whole organization, however, we can scarcely doubt that *Pitys* and its allies were Gymnospermous Seed-plants." Our knowledge of these trees is mainly based on the structure and minute anatomy of the woody stem, which is often well preserved. The pitting of the wood elements is similar to that of Araucarian conifers of the

Photograph by H. G. Herring.

TRUNK OF THE FOSSIL TREE (*Pitys withami*) IN THE MUSEUM GROUNDS.

The building in the background is the Victoria and Albert Museum, on the other side of the Exhibition Road.

present day, but *Pitys* differs from these trees in having a large pith in which strands of conducting tissue are scattered, usually round the edge of the pith. "The occurrence of separate strands of primary conducting tissue," writes Prof. A. C. Seward, "seems to be an archaic feature which did not persist in later products of evolution." A restoration showing the presumed appearance of *Pitys*, given in Prof. Seward's recently published work, "Plant Life through the Ages" (1931, Fig. 60), is reminiscent of some sort of pine or fir.

The history of the great trunk in the Museum grounds is of some interest. Curiously enough, there was until recently no information on the label as to its acquisition, and it is not mentioned in the "History of the Collections"; it has commonly been supposed to be part of the original tree found in 1826, the internal structure of which was first described by Henry Witham of Lartington in 1831. In point of fact the tree was excavated in 1873, and is one of several trunks found at various times in Craigleith Quarry, all apparently belonging to *Pitys withami*. All are incomplete portions of trees of large size, with none of the bark preserved and with no branches or roots attached; they must therefore have been water-borne logs not growing exactly on the spot where they were found. The logs are now calcified, and the siliceous sandstone in which they are embedded has in parts a calcareous cement; the petrifaction of the trees and the consolidation of the sands may therefore have taken place simultaneously. According to accounts given by Sir Robert Christison,* the British Museum specimen was first brought to light about 1858, and after having been covered with detritus was again uncovered in 1873. This tree, the largest of seven which had been found in a period of fifty years, was presented to the nation by Mr. T. S. Hunter, the owner of the quarry, at the instigation of Sir Robert Christison, who was then President of the Royal Society of Edinburgh. The excavation work was directed by Mr. P. Tait, and it was at the instance of his son (Mr. P. G. Tait, of Melbourne), who remembered seeing the tree in Craigleith Quarry as a boy, that a search was recently made into the records in order to trace the history of its acquisition. The trunk was received, in six large and numerous small pieces, in December 1873, and William Carruthers, then Keeper of Botany, reported that "when placed together they will form a trunk between 35 and 40 feet in length, with a circumference of between 11 and 13 feet." There is a polished slab of *Pitys withami* in the Botanical Department, also acquired from the same quarry in 1873, but cut from a different specimen. The erect trunk in the grounds is nearly 20 feet high, and the block lying on its side with one end cut accounts for another four feet. In Gallery X of the Geological Department is a polished slab, less than one foot in thickness, which was cut from this block; the total length which can now be traced is therefore less than 25 feet. The remainder must have been too fragmentary for incorporation when the trunk was finally erected on its present site in 1887, after lying in the gardens for six or seven years. The tree, which is composed mainly of carbonates of lime, magnesia, and iron, with a thin coaly crust in parts (formerly covering the whole trunk, but not representing the bark), has been little affected by half a century's exposure to the atmosphere of London.

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* *Roy. Soc. Edinburgh, Proc.*, vol. viii, 1873, pp. 104–8, 1874, pp. 241–3; *Trans.*, 1874, vol. xxvii, pp. 203–21.

BOOK NOTICES.

A Naturalist in Brazil. The Flora and Fauna and the People of Brazil. By KONRAD GUENTHER. Translated by BERNARD MIALL. Pp. 400; 32 full-page plates with 71 illustrations, and 40 text-figures. (London: George Allen and Unwin, Ltd. 1931. 25*s*.)

PROBABLY every naturalist, at one time or another, has had a desire to visit Brazil, and consequently many will read the present book with a view to testing their old feelings, which they derived principally from the writings of Bates and Spruce. Those who read it with this purpose will regain much of the old thrill, for a good general account of the country is given. The book is a translation from the German, the original having the title of "Das Antlitz Brasiliens." The author spent a year in Brazil and some months in Argentina, having received an invitation from the Government of the State of Pernambuco "to combat the insects which were injuring the plantations." Sixteen years ago he had spent a year in Ceylon, and so is able to make some general comparisons of tropical life. It is extremely unfortunate that the publishers have chosen to say on the wrapper that "Dr. Guenther was employed as 'pestologist,'" a description which is wrong in every possible way and one which will not increase the sale, particularly amongst entomologists.

The book is written in a popular style and is illustrated with photographs and sketches by the author. Its tone may be gauged by a statement in the preface: "In order to set a good example, I refrained all the time I was in Brazil, as I refrained while I was in Ceylon, from ever firing a shot. And I can here assure the reader that the best way of understanding a whole country—as it is the best way of understanding an individual creature—is to love it."

Though, as is to be expected, there is much in the book that is fairly common knowledge and much that is elementary, few will read it without gaining information on interesting biological facts. There is an old-fashioned flavour in parts, which adds to its attractiveness; teleological explanations are to be expected where adaptations abound, but it is refreshing in these days for the Creator to be mentioned when the harmony of nature is discussed. This does not prevent the author speaking his mind about the effect of oil on bird life, the useless slaughter of supposedly dangerous animals, the reckless persecution of others, and so on.

The book opens with a brightly coloured account of the country, and then proceeds with a description of the ocean shore. A series of three chapters—The Virgin Forest, The Lianas, Epiphytes and Parasites—gives a fascinating account of the vegetation with surprisingly odd facts, which could only have been learned on the spot. The interior of the country is dry and the description of the " desert " is in striking contrast to what is probably the most luxurious vegetation in the world. After dealing with tropical gardens and plantations the account proceeds to the animal world. Nature as an Organism, and The Mosaic of Colours are two chapters which give the author full scope both as a naturalist and as a writer, and what may be considered as supplementary chapters—The Flowers of Brazil, The Symphony of Voices and Careful Mothers—are in the same strain. Three chapters on insect life, which treat of Wasps and Bees, Ants, and Termites, are those to which many will turn, for it was Bates in his " The Naturalist on the River Amazon " who first described the amazing symbiosis of the leaf-cutting ant and a fungus. The symbiosis of insect and fungus is now well established and a clear description is given of the different aspects of the phenomenon as it occurs in Brazil. The last chapters are on Snakes and Bloodsuckers, and The Brazilians, though the sequence of ideas is apparently not intentional. Four composite plates show the more primitive mammals, birds, insect mimicry, and snakes, and add to the attractiveness of the volume. There is an excellent index of scientific and popular names.

The Standard Natural History. Edited by W. P. Pycraft. Pp. xlv + 942; 12 coloured plates; over 900 text-figures. (London: Warne & Co., Ltd. 1931. 15*s*.)

In " The Standard Natural History " the editor and his contributors have attempted a very big task and have undoubtedly achieved that which they set out to do, namely, to produce a comprehensive survey of the Animal Kingdom in one volume. With one exception all the contributors are members of the scientific staff of the Museum, and Mr. Pycraft and his colleagues have been able to put together a regular zoological *multum in parvo*. The work is thoroughly up to date, and coming as it does from the head-quarters of natural history may be relied upon.

The book is in two parts; Part I including all the Invertebrates from Amœba to Arachnida. The first three sections of this part, by M. Burton, deal with the least highly organized members of the Animal Kingdom, namely, the Protozoa, Porifera, and Cœlenterata. These three phyla are treated in considerable detail, though lack of space prevented the author dealing with the economic side of the parasitic Protozoans. Some interesting Foraminfera and Radiolaria are figured in the first section, and one of the coloured plates, with which the volume is illustrated, is devoted to various species of sea anemone. The chart, with names, accompanying this and other of the coloured plates, render the identification of these figures a very simple matter.

Section iv is given over to the various kinds of worms, the greater part of this section being from the pen of C. C. A. Monro. The group Vermes is here classified in nine phyla, the Chætognatha being considered as the ninth phylum. Two short chapters, or Sections v and vi, by M. Burton and G. C. Robson on the Polyzoa and Brachiopoda respectively, are followed by 24 pages by C. C. A. Monro on the Echinoderma, comprising Section vii. This section and the following one (Mollusca by G. C. Robson) are full of interesting material and very well illustrated; both these sections are accompanied by coloured plates, namely, one of star-fishes from the Torres Straits and an excellent picture of land molluscs.

Section ix contains the whole phylum Arthropoda and concludes the first part of the volume. This section, which is the largest of these divisions, extending as it does for over 250 pages, commences with a brief classification of the phylum and an introduction by W. T. Calman. The same author contributes Chapters i and ii of this section, these chapters dealing with the Trilobita and Crustacea respectively. The latter class has been dealt with at some length, and is illustrated by quite a number of text-figures and a coloured plate of Æsop prawns showing colour phases.

A special chapter is devoted to *Peripatus*, the class Prototracheata (Onychophora) being placed between the Crustacea and Myriapoda; the account of this link between Arthropods and Annelid worms is written by N. D. Riley and is illustrated by a figure of a South American species. The Myriapoda are briefly dealt with in Chapter iv by T. H. Savory, and Chapter v includes all the insects. With the exception of those pages dealing with the Coleoptera, Diptera, and Siphonaptera, this chapter is the work of N. D. Riley, and covering as it does such an immense range and variation of species is one of the most interesting parts of the volume. The Insecta are divided into three sub-classes, containing some 21 orders. Each order is, with the exception of the fleas (Siphonaptera), as fully illustrated as the size of the work permits, both the text-figures and coloured plates being good. The Coleoptera are dealt with by G. J. Arrow, and some of his illustrations are extremely interesting and reminiscent of scenes in " The Insect Play." The pages devoted to flies and fleas are from the pen of F. W. Edwards. Chapter vi, by T. H. Savory, includes the Arachnida and concludes the section.

Part II is concerned entirely with the sub-kingdom Vertebrata, commencing with some introductory remarks (Section x) by M. Burton on the phylum Chordata; this author then deals with the primitive vertebrates representing the group Protochordata (Acraniates). Section xi, by J. R. Norman, commences the Craniata with some 70 pages filled with an account of the classes Selachii and Pisces. Included in this section is a very handsome coloured plate of Coral reef fishes from the Philippine Islands. Numerous text-figures are also given and help to make fishes an attractive subject. Sections xii and xiii, by H. W. Parker, deal with the Amphibia and Reptilia respectively, and some of the illustrations are especially pleasing. The account of the reptiles opens with some introductory remarks concerning such fossil forms as no longer exist, and from consideration of the " Age of Reptiles " we pass on to the archaic Tuatera, crocodiles, tortoises, lizards, and the sub-order Ophidia.

Section xiv, by the editor, is devoted to a fairly detailed account of the birds: this section, which occupies over 200 pages, is divided into ten chapters, the first of which deals with *Archæopteryx* and includes some general remarks on the Sub-class Neornithes. Then follows an account of the various orders of living birds accompanied by a large number of text-figures and two coloured plates. The last section (xv), by J. G. Dollman, deals with the class Mammalia and brings a most entertaining and instructive volume to a close. This section, which occupies some 138 pages divided into eight chapters, is, as with the other vertebrate sections, very largely illustrated by photographs, the majority of which are here published for the first time.

The publishers, editor, and his collaborators are to be congratulated on this volume, which should have a very wide appeal, since it deals with the subject in a manner equally attractive to the student and to the " man in the street."

Butterfly and Moth Book. By Helen Robertson-Miller. Revised and enlarged edition. Pp. xxiv + 286; text illustrated. (New York: Charles Scribner's Sons. 1931. 10*s.* 6*d.*)

The forty-two short chapters which make up this popular book on North American Lepidoptera appear to have been written at various times over a period of years. Each deals with the life-history of one, or occasionally several, of the species of butterfly or moth, and they all attain to a very high standard of accuracy, which is refreshing in a work the appeal of which is obviously to the non-technical public. The species are chiefly the larger and more conspicuous Emperor or Silk Moths, Hawk Moths, Swallowtail and other butterflies, of the kinds most likely to arouse the curiosity of the tyro and perhaps kindle a genuine and lasting interest; but many other smaller and less obvious kinds are also dealt with. Perhaps the best chapters are those which appear to be amongst the first to have been written, when Miss Robertson-Miller's own early entomological thrills were both many and frequent, such as the accounts of the Moon Moth (*Actias luna*, Chapter v) and of the Painted Lady (Chapter xxvi). Especially notable is the account of the little Tineid moth, *Pronuba yuccasella*, which deliberately pollinates the Yucca and so ensures the ripening of seed for its progeny to feed upon. These observations confirm those made many years ago by C. V. Riley, it is true, but very little has been added in the meantime. A good deal of the information in Chapter xli, however, appears to be new. This chapter records the results of much patient work upon an aquatic moth larva (*Bellura gortynides*), which bores in the stems of pond-lilies and appears to be equally at home on land or in water, swimming freely from plant to plant as necessity arises. Other interesting chapters deal with the Poinsettia and its guests, Bag-worms (Psychidæ), the Little Blue and its seasonal variation, the migratory Monarch, and, in another chapter, one of its mimics. Indeed, the book is well planned to illustrate many of the wider interests of a study of butterflies and moths, and few opportunities of directing attention to them are missed; we have read it through from cover to cover and enjoyed it, even though some of its Americanisms have rather tripped us up at times. The make-up is good and the numerous illustrations, with very few exceptions, excellent. It is a book one would have no hesitation in recommending to the class of reader for whom it is intended, in spite of one or two minor misconceptions which have crept in here and there; but we should like to see the scientific names added to the titles in the Table of Contents.

Thought-transference (or what?) in Birds. By Edmund Selous. Pp. xi + 255. (London: Constable & Company, Ltd. 1931. 7*s.* 6*d.*)

Anyone who has watched the "aerial drill" of a flock of starlings, for example, soaring and wheeling, diving and settling as if at the word of command, must have wondered how their synchronization of movement is obtained. Mr. Selous has brought together a large number of field-notes which, he thinks, point to some means of communication between individual birds other than those provided by the sense-organs. If his conclusions are to be confirmed or controverted, it must be by someone with patience and experience in bird-watching equal to his own.

Photographs of Bird-life in Japan. Directed by Dr. Seinosuke Uchida. Photographed by Kenji Shimomura. Vol. II. Birds of Mount Fuji. 58 Plates with descriptive letterpress. Printed in English and Japanese. (Tokyo and Osaka: Sanseido Co., Ltd. 1931. Y. 4·00.)

Through the enlightened policy of the Japanese Ministry of Agriculture and Forestry a reserve of 30,000 hectares was formed in 1924 on the northern slopes of Mount Fuji. In this area some 116 different kinds of birds are known to nest, including that rare visitor to our islands, White's Thrush.

Starting with a general account of the reserve, Dr. Uchida goes on to give in more detail a description of the different areas and sub-areas into which he divides it, with some remarks on the typical birds inhabiting each. This is followed by photographs of different birds or their nests, accompanied by short accounts of each in Japanese and English.

The photos vary considerably in merit; some are hardly as clear as they should be, while others are as good as can be desired. Among the latter we should mention the pictures of the Siberian Stone Chat, the young Ural Owl, and the Japanese Bush Warbler, all very pleasing.

There is a very characteristic photograph of a Bonaparte's Japanese Bunting, with head thrown back and beak open, singing on the top of a pine branch. But perhaps the most interesting photographs are those of two different kinds of young Cuckoos in the act of being fed by their foster parents. In one case a young Amoor Cuckoo is sitting on a man's hand, and a Japanese Blue Flycatcher is feeding it. Another picture shows a half-grown Himalayan Cuckoo perched on a dead stump with mouth wide open, while a small Crowned Willow Warbler with whirring wings is placing food in its mouth.

Dr. Uchida and his photographer Kenji Shimomura are to be congratulated on this delightful series of pictures.

Beauty in Animals. Pp. xvi, with 64 illustrations. (London: George Routledge and Sons, Ltd. 2*s.* 6*d.*)

THIS little book contains much that is beautiful. It commences with an introduction by Friedrich Schnack, followed by a short description of each of the sixty-four pictures contained in the volume. These brief notes, in spite of their poetic style, are mostly instructive and add considerably to the value of the work.

It is a pity that the book was not edited more carefully and such small errors as are contained in it eliminated. It is a little difficult to understand why the hippopotamus is described as an "insatiable beast."

The illustrations are excellent and are in complete accord with the title of this charming little volume.

The Social Life of Monkeys and Apes. By S. ZUCKERMAN, Anatomist to the Zoological Society of London. Pp. xii + 357, with 24 plates. (London: Kegan Paul, Trench, Trübner & Co., Ltd. 1931. 15*s.*)

THIS volume is largely based on a detailed study of the social life of the Hamadryas baboons of Monkey Hill at the Gardens of the Zoological Society of London.

The chapters on "Sexual Periodicity," "The Breeding Season and Society," and "Reproduction Processes of Lower Mammals" contain a wealth of information, not previously put on record. The chapters on "Apes and Monkeys in the Wild" and "Baboons in South Africa" show that the author has first-hand knowledge of these animals in their natural state.

The Eastern gorilla (*Gorilla gorilla beringeri*, not *Gorilla* "*beringei*") is referred to as a more powerful animal than the Western form. Upon what evidence this statement is founded is not clear, but it would appear to be contrary to the experience of hunters, such as Major Powell-Cotton, who have shot the Western gorilla.

The illustrations are mainly from excellent photographs of the inmates of Monkey Hill, and the volume should make a strong appeal to the anatomist and zoologist.

Paradise Quest. By Lee S. Crandall. Pp. xvii + 226, with 52 illustrations on 31 plates. (New York and London: Charles Scribner's Sons. 1931. 10*s.* 6*d.*)

Mr. Crandall gives in " Paradise Quest " an interesting account of a journey to New Guinea for the purpose of collecting live specimens of the various species of birds of paradise.

The book opens with a short introduction dealing with the author's voyage from New Guinea, and the past history of the collecting of birds of paradise. The first evidence of these birds to reach Europe was two skins of the greater bird of paradise brought home in 1522 by the Magellan Expedition. Like most native skins, these specimens were without wings or feet, and for many years it was thought that the birds had neither wings nor feet; hence the name *Paradisæ apoda.*

Two living specimens of the lesser birds of paradise were brought to the London Zoological Gardens by Alfred Russel Wallace in 1862, these being the first of the group to be seen alive in Europe. No living specimens reached America until nearly fifty years later, when in 1910 three greater birds of paradise arrived at the New York Zoological Park. Great difficulty has always been experienced in getting together a representative collection of these birds through the ordinary channels, and it was therefore decided by the New York Zoological Park to send a special expedition to New Guinea for this purpose. A similar expedition, under the leadership of Mr. Shaw Mayer, has recently been undertaken on behalf of the Zoological Society of London.

The chapters dealing with the early stages of the journey in New Guinea are full of interest. The collecting was all done in British New Guinea (" Territory of Papua "), the expedition starting from Port Moresby and making its way through the various Mekeo villages to the interior. An account of the bower bird and its bower is given in Chapter 3; this is accompanied by excellent illustrations of this bird and its bower. Emphasis is laid on the fact that, in spite of the natives speaking of these bowers as nests, they are used entirely for courtship and not for the rearing of young.

The actual collecting of paradise birds was commenced at Deva-deva. Illustrations of Count Raggi's bird of paradise, the lesser superb bird of paradise, and many other species are included among the photographs illustrating this book. An account of how the Count Raggi's bird and Prince Rudolph's blue bird of paradise are captured by the natives while the birds are dancing in their dancing-places in the trees is of exceptional interest.

The illustrations of the natives are all good, and this volume may be recommended to anyone interested in New Guinea and the study of paradise birds.

An Introduction to the Literature of Vertebrate Zoology, based chiefly on the titles in the Blacker Library of Zoology, the Emma Shearer Wood Library of Ornithology, the Bibliotheca Osleriana and other libraries of McGill University, Montreal. Compiled and edited by Casey A. Wood, M.D., LL.D. Pp. xix + 643, frontis. col. (London: Oxford University Press. 1931. 63*s.*)

This imposing-looking volume, the title of which is slightly misleading, is intrinsically an annotated and descriptive catalogue of the works on vertebrate zoology, and particularly on ornithology, that are housed in the various libraries attached to McGill University. The catalogue is prefaced by an introductory historical sketch of the literature of vertebrate zoology from Aristotle to the present day, and there is, in addition, an index to short author-titles, arranged geographically and chronologically, which is contrived especially for the assistance of students and librarians.

The field which this work seeks to cover is stupendously wide; but Dr. Casey Wood warns us in his preface that he makes no claim whatever for his work as a complete study of the literature of vertebrate zoology, although he does offer it to the student and to the librarian as an introductory study and work of reference which may help them with information on matters of bibliography, biography, and the general history of the subject. For example, the historical introduction should prove most helpful for those who want to know a little, say, about the Oriental literature on vertebrate zoology. Or again, those who require a few notes on animal painters and illustrators, or workers anxious for information about the more important works on herpetology, for instance, published during the last two centuries, should all find some answer to their inquiries in this work. The field being so vast, the information given is sometimes inevitably meagre, but we must be grateful to Dr. Casey Wood for having provided us with a work which, we hope, will prove the stimulus to the production of similar works, more detailed and more developed than the present one through its very nature ever could have been.

In his " Students' and Librarians' Ready Index " the compiler has attempted to smooth the sometimes thorny path of the librarian or student who is suddenly told to find, for example, a book on the birds of Greece or one on the fishes of Patagonia. In the event of the work sought for not being found in the Students' Index—that is, if it is not in the McGill libraries—the compiler has given a short note on " how to find information regarding unusual titles in vertebrate zoology " which should be useful to those who are just imbibing the principia of zoological bibliography.

RECENT IMPORTANT ACQUISITIONS.

Department of Zoology.

Collection of Chinese mammals; presented by Capt. G. Fenwick-Owen. It includes two skins and skulls of the Blue Bear (*Ursus pruinosus*), and the skins of four Golden Takins (*Budorcas bedfordi*).

Collection of 169 mammals obtained by Mr. G. W. Foster; presented by the Game Department of Uganda. It contains a series of Duikers, a Flying Scaly-tail (*Anomalurus*), and a Mongoose of the genus *Crossarchus*.

Cast of the Sword-fish (*Xiphias gladius*) landed at Brighton in July 1931; presented by Lord Rothschild, F.R.S. The fish, 8 ft. 6 in. in total length, was caught in the mackerel nets of fishermen between Brighton and Dieppe. The cast was made by Messrs. E. Gerrard & Sons.

Twelve enlargements of the photographs taken by Mr. Marcuswell Maxwell in the gorilla country of the Birunga Mountains, north-east of Lake Kivu, Belgian Congo; presented by the Proprietors of *The Times*.

A large collection of Big Game trophies from Africa, Asia, and North America, formed by the donor; presented by Major F. Lort-Phillips. Included in the collection are some fine heads of Moose, European Elk, Wapiti, Caribou, Pronghorn, Beisa, Gerenuk, and Black Rhino, and complete specimens of an Indian Wolf, two young Timber Wolves, and three species of Bear.

A mounted head of a Dwarf Buffalo shot by the donor in the Ituri Forest, Belgian Congo; presented by Col. H. C. Ashton.

A fine photographic enlargement of an East African Lion, standing under a thorn tree on the Serengeti Plains in Tanganyika Territory; presented by Lady Broughton. The photograph was taken by the donor this year.

Collection of mammals from the Cameroons; purchased. It contains two specimens of the Water Chevrotain (*Hyemoschus aquaticus*) and a specimen of the Otter-shrew (*Potamogale velox*).

Department of Entomology.

A further selection from the donor's collection, consisting of over 2000 butterflies, of very great value and interest to the systematist, and thousands of moths, including the whole of the donor's Indo-Australian Noctuidæ, the Geometridæ other than the African species, the Ægeriidæ, and the types of many species belonging to other families; presented by Mr. J. J. Joicey.

Collection of about 13,000 insects, chiefly beetles, butterflies and moths from various localities; presented by the Executors of the late Mr. R. T. Francis.

Upwards of 3000 butterflies from the region bordering on the north-eastern Adriatic; purchased.

Department of Geology.

A mammoth tusk, nearly 14 feet long, from Siberia; presented by the Rowland Ward Trustees.

Cretaceous molluscs from Persia; presented by the Anglo-Persian Oil Company.

Molluscs from the Oligocene of Ecuador; presented by Dr. G. Sheppard.

Two nearly complete skeletons of the reptile *Pachypleurosaurus* from the Alpine Trias; purchased.

Plaster-cast of a nearly complete skeleton of the Triassic reptile *Placodus*; purchased.

Type specimens of Triassic reptiles from South Africa; purchased.

Skull of a fossil dolphin, dredged from the North Sea; purchased.

Department of Mineralogy.

A small fragment sawn from 12-ton mass of meteoric iron, found in October, 1930, near Mbosi, between Lakes Nyasa and Tanganyika; presented by Mr. H. V. B. Lloyd Phillips.

Vanadiferous nodules from the Permian beds of South Devon; collected and presented by Mr. G. E. L. Carter and Dr. L. J. Spencer, F.R.S.

A mass of meteoric iron found in May 1931 around the large meteorite craters near the Henbury cattle station, Finke River, Central Australia; presented by Prof. Kerr Grant.

Fragments of an unusually coarsely crystallized meteoric stone, which fell on July 27, 1931, at Tataouine, south Tunisia; presented by Dr. Marcel Solignac.

Mendipite from Långban, Sweden; presented by Prof. E. Lönnberg.

A series of pegmatite minerals, including pitchblende, gadolinite, and fergusonite, from Gordonia, South Africa; collected, described, and presented by Prof. E. D. Mountain.

Finely crystallized specimens of copper ores (chalcopyrite and enargite) from Morococha, Peru; presented by Mr. W. Campbell.

Samples of fluorspar, representing the various types and colours from the Spar Mountain Mine, Illinois, U.S.A.; presented by Mr. D. Stanton.

A piece, weighing 10 lb., of a new type of stony-iron meteorite (siderolite) found in 1930 near Bencubbin, Western Australia; presented by Dr. Edward S. Simpson.

Turquoise from St. Austell, Cornwall; presented by Mr. J. Herbert Thomas.

Fragment of a new species Ramdohrite, from Bolivia; described and presented by Dr. Friedrich Ahlfeld.

Fragment of a new species Flagstaffite, from Arizona; described and presented by Prof. F. N. Guild.

A selection of gem-minerals from Madagascar; purchased.

Two small nuggets of platinum, showing impressions of the matrix, from Sierra Leone; purchased.

Clarkeite, a new uranium mineral, from North Carolina; purchased.

A large polished slab of pitchblende, from Cornwall; purchased.

Department of Botany.

The collection of plants presented to the King by the University of Buenos Aires, placed on permanent loan by His Majesty. It contains 302 named plants, which are of great scientific and historical interest, as they were gathered during the Delimitation Expedition (1902–3) under Col. Sir Thomas H. Holdich, the delegate appointed by King Edward at the request of the President of Argentina and Chile to determine the Patagonian Argentine–Chile frontier. The University of Buenos Aires arranged for certain members attached to the Expedition to make a systematic botanical survey of the areas visited. The dried specimens were divided into three lots, of which one was kept at Buenos Aires, the second presented to the Valparaiso Museum, and the third preserved until an opportunity arose of delivering "with the homage of Argentina to His Britannic Majesty this historical material collected in fulfilment of the judgment which re-established peace and harmony between the sister-nations." The collection was entrusted to Lord Moynihan during his recent visit to Buenos Aires. It is accompanied by two magnificently bound volumes of collotype reproductions, the one containing unpublished letters of A. von Humboldt and the other the botanical journal of his pupil, A. J. A. Bonpland.

Series of 446 Angolan plants; collected and presented by Mr. J. Gossweiler.

Collection of about a thousand mounted specimens, representing 425 species of West Indian algæ, collected mainly by Mr. G. Tandy, while working at the Marine Biological Laboratory of the Carnegie Institution of Washington at the Dry Tortugas, Florida, and partly by Mr. John Colman, who was working on zoological problems; presented.

The collection of 727 specimens of fungi which formed the basis of Dr. Albert Pilat's monographs on Stereaceæ and Aleurodiscaceæ; purchased.

Library.

"A Natural History of the Ducks," by John C. Phillips, 1922–26; presented by Dr. Casey Wood, LL.D.

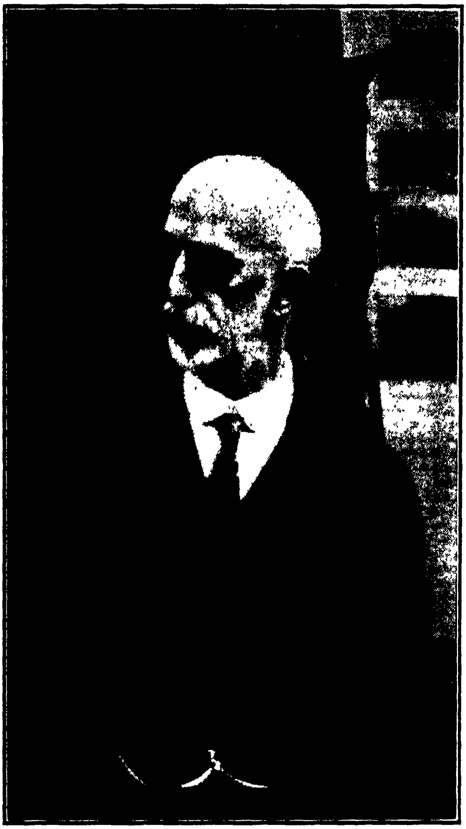
Eight rare Linneana; presented by the Friends of the National Libraries, with the co-operation of Mr. B. H. Soulsby.

OBITUARY.

JOHN HENRY LEONARD.

(1864–1931.)

To the general public the most familiar member of the Museum staff is the Guide Lecturer, and there will be many of the thousands of visitors that have attended Mr. Leonard's tours since they first began nearly twenty years ago, who will have learnt with much regret of his death. Until his last illness he enjoyed excellent health and seldom missed a tour through indisposition. He became too ill to continue his duties in October and had to retire to a Kensington nursing home on the 19th of that month; there was unhappily never any hope of his recovery and he died there on the 4th December. He was interred at the Kensington New Cemetery, Gunnersbury, on the 8th. The Museum was represented at the funeral by Dr. W. T. Calman, F.R.S., Mr. J. Ramsbottom, O.B.E., and Dr. G. F. Herbert Smith.



JOHN HENRY LEONARD, B.SC., GUIDE LECTURER 1912–1931, PHOTOGRAPHED WHILE DEMONSTRATING AN EXHIBIT.

Mr. Leonard was born on April 19, 1864, and was educated at Kensington Grammar School and at King's College and University College, London, where he graduated B.Sc. in zoology, botany, and geology, with honours in the last subject. He had a varied career, including teaching and demonstration work at some of the exhibitions in London. He was appointed on May 20, 1912, to the then newly-created post of Guide Lecturer at the Natural History Museum, and proved very successful in his work.

Natural History Magazine

No. 23 JULY, 1932 Vol. III

SOME CURIOUS BIRD PARASITES.

By E. E. Austen, D.S.O., Keeper, Department of Entomology.

Early one summer morning, through the open window of a room in a well-known Convalescent Home, there flew what

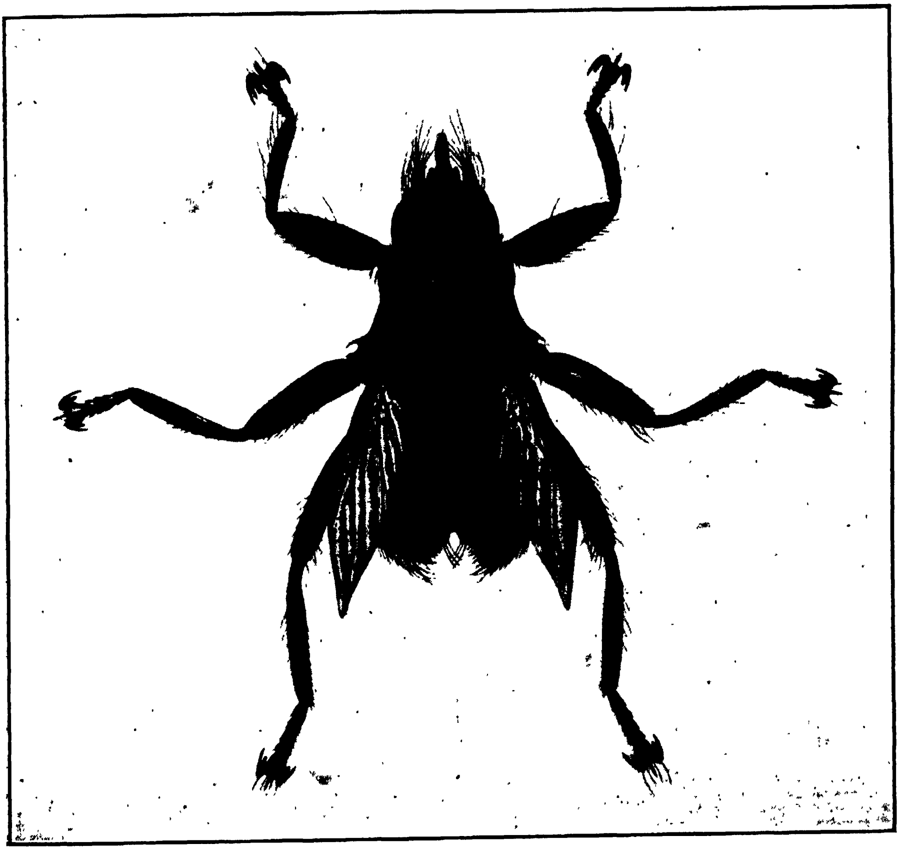


Fig. 1.—*Crataerina pallida*, Latr., a fly parasitic on the Common Swift.

was described by the servants who caught and released it as "a very odd-looking bird." Crawling actively all over it, and especially abundant under the wings, were numbers of strange, flattened insects, green in colour and rather more than a quarter of an inch in length, some of which were afterwards found in the room. What could the bird have been? Fortunately it occurred to a senior member of the nursing staff, who was puzzled by its description, to submit one of the parasites to a specialist, when the mystery was forthwith solved. The insect, which is shown greatly enlarged in the accompanying illustration (Fig. 1), is known to entomologists as *Crataerina pallida*, Latr. (unhappily it has no English name), and in this country its only host is the Common Swift, although in Southern Europe it also occurs in the nests of the Alpine Swift.

Little though it resembles the Common House-Fly in general appearance, *Crataerina pallida* nevertheless belongs, like the other species of which illustrations are given in this article, to the same order of insects, namely, the Diptera or Two-Winged Flies. It is also (again like the other species figured) a *blood-sucking* fly, so that the toll taken by it from its host is very different in character and importance from that exacted by Bird-Lice, which are mere nibblers of feathers and particles of skin. Again, in proportion to that of a Swift, the size of *Crataerina* is large, so that when the parasites are as numerous as in the instance recorded above the toll exacted must be severe indeed. As has been noticed by more than one observer, Swift colonies, like those of House-Martins, sometimes show a marked falling-off in strength as compared with their state in the previous year, and in some cases the diminution in numbers has been ascribed to human agency. Labels attached to certain specimens of *Crataerina pallida* in the National Collection suggest, however, that there is perhaps another explanation. In at least four cases from localities as widely separated as Wimbledon, Hanwell, Sandy (Bedfordshire) and Clevedon in Somerset, the insect, sometimes with a number of others, is stated to have been taken from a Swift found in a half-dead or dying state. At Sandy, in July 1930, a number of Swifts were found dying in the garden of a house which sheltered an old-established colony, and each bird proved to be infested with one or more of the flies. It is therefore natural to wonder whether the latter could have been in any way responsible for the condition of the bird. Failing a blood-examination of a moribund Swift, and a corresponding investigation of the internal organs of any *Crataerina* found upon it, further speculation would be useless; but at least it is interesting to note that in the blood of Swifts in Italy there have been found organisms (" trypanosomes ") closely akin to those which, in Tropical Africa, cause Sleeping Sickness in man and *Nagana* in domestic animals, and are carried by Tsetse-Flies. Whatever be the case with regard to Swifts, that *Crataerina pallida* can convey any form of disease to human beings is practically beyond the bounds of possibility.

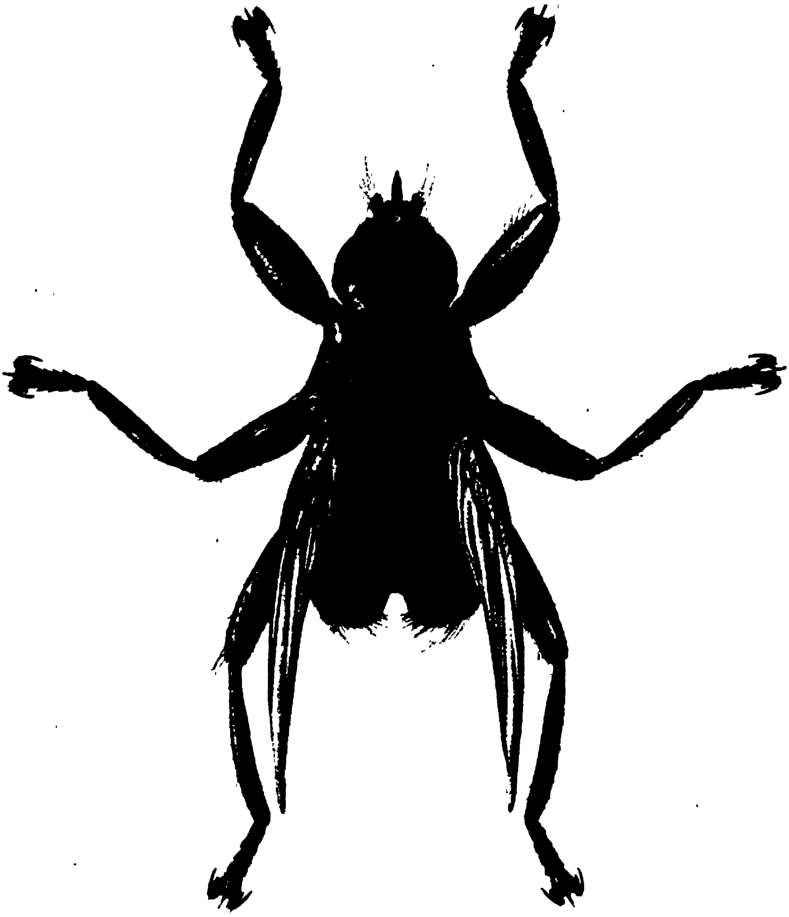


FIG. 2.—*Stenepteryx hirundinis,* Linn., a dipterous parasite of the House-Martin.

Still it may be worthy of remark that, if for any reason these flies should become separated from their natural hosts and their nests (wherein the insects also often abound) and enter the living-rooms of houses, they may attack the inmates. Thus it is stated by a German writer (Dr. Erich Hesse) that, during the summer of 1918, several cases occurred at Leipzig in which *C. pallida* " made itself very troublesome " to people in bed at night, and other instances of a similar kind are on record. The bite is said to feel somewhat like that of a midge.

Closely related to the parasite of Swifts, but differing conspicuously from it in the shape of the much-modified wings, is the strange-looking fly known as *Stenepteryx hirundinis*, L. (Fig. 2), which is found on, or in the nests of, the House-Martin. A comparison of the illustrations of *Crataerina* and *Stenepteryx* (Figs. 1 and 2) with the figure of the Grouse-Fly (*Ornithomyia lagopodis*, Sharp, Fig. 3) will show the extent of the reduction of the wings in the two former, each of which appears to be incapable of flight, and therefore closely attached to the avian host and its nest, whereas *Ornithomyia* is equipped with quite serviceable wings for short journeys. It will be seen, however, that whereas the hinder portion of the wing has disappeared in both *Crataerina* and *Stenepteryx*, the reduction has proceeded differently in the two cases, and that while in the former the wings still look like what they actually are, in the parasite of the House-Martin they have become narrow, ribbon-like strips. In accordance with the size of

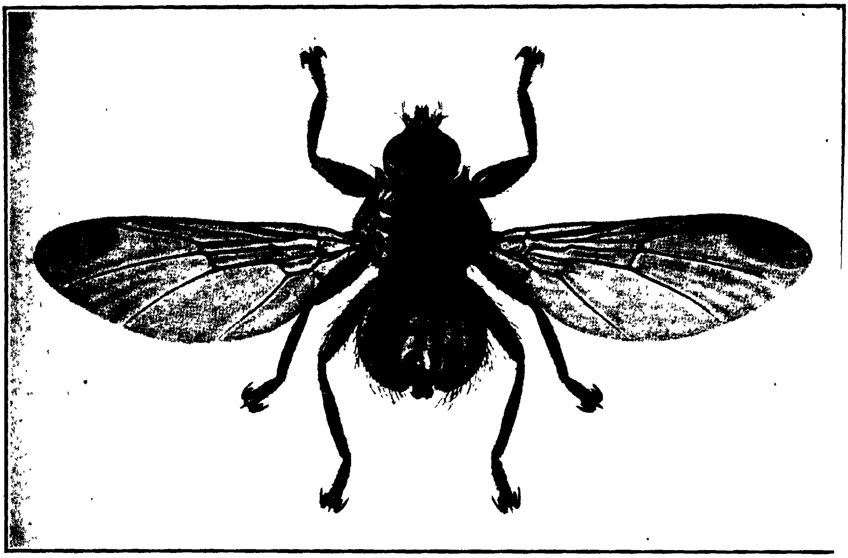


Fig. 3.—*Ornithomyia lagopodis*, Sharp, a parasite of the Red Grouse.

the respective hosts, *Stenepteryx hirundinis* is as a rule considerably smaller than the parasite of the Swift, and even the largest specimens measure little more than one-sixth of an inch in length.

In default of freely besprinkling Swifts and House-Martins, and their nests, with a powerful insecticide such as pyrethrum powder, which is obviously impracticable, it is difficult to see that the bird-lover can do anything to rid the victims of their unwelcome and possibly baleful companions.

Anyone who has shot Grouse in Scotland, and has handled birds just killed, is likely to know the occasional tickling sensation caused by a Grouse-Fly alighting on his neck or hurriedly retreating up his arm. This fly may also be found freely in larders containing freshly-killed Grouse, but here after a short time it leaves the birds and is to be seen on the windows. People handling Grouse are sometimes bitten by the insect, which, however, is by no means exclusively confined to the Red Grouse. Although all the specimens of *O. lagopodis* in the British Museum are from beyond the Border, the birds whence they were taken include, in addition to Grouse :—Blackcock, Snipe, the Oyster-catcher, Rock Pipit, Meadow Pipit, Wheatear, Golden Plover, Peewit, Curlew, a Song Thrush and an Owl. As is natural, seeing that the fly breeds in the nest of its host, young as well as adult birds are infested. The Grouse-Fly, which is a much darker insect than the parasites of the Swift and the House-Martin, the front part of the body (thorax) being blackish-brown, measures about one-sixth of an inch in actual body-length and is therefore of much the same size as *Stenepteryx hirundinis*. Since, however, in this as in other species of *Ornithomyia*, the wings when not in use are closed one over the other like the blades of a pair of scissors, and project considerably beyond the body, the insect when crawling or running appears longer. In addition to the Grouse-Fly, two other species of *Ornithomyia* occur in the British Isles : of these *O. avicularia*, Linn., a greenish fly rather less than a quarter of an inch in length, is found on birds of many different kinds, while *O. fringillina*, Curt., which is only half the size of the foregoing, is represented in the British Museum by specimens from a young Robin and a Swallow.

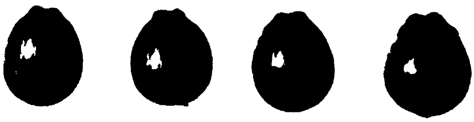


FIG. 4.—*Ornithomyia avicularia*, Linn.; pupæ (much enlarged) from a Tit's nest.

Not the least of the peculiarities of the flies of which a brief account has been given in this article is their mode of reproduction. Instead of laying eggs like the majority of the Diptera, the female produces at each birth a single *full-grown* larva or grub, which, prior to extrusion, has been nourished within the body of the mother by the secretion from a special gland. At first milky-white in colour, with a black cap at the posterior end, the outer covering of the larva, which is quite incapable of crawling, soon hardens, and the motionless larva becomes a shining black, ovoid, pupa or chrysalis, whence a new fly will issue in due season. It is probable that the larva is extruded by the mother fly among the feathers of the host, and that the polished pupa, which has the appearance of a seed, rolls thence into the nest, where it may subsequently be found. The pupa of *Crataerina pallida* is rather more than one-sixth of an inch in length; that of *Ornithomyia avicularia* (shown in Fig. 4 on the previous page) measures just over an eighth of an inch, and is therefore considerably smaller.

THE OLDUVAI EXPEDITION, 1931.

By A. TINDELL HOPWOOD, M.Sc., Assistant Keeper, Department of Geology.

THE Olduvai expedition of 1931 was a joint venture, in which both the Trustees of the British Museum and the British East Africa Archæological Expedition were represented. The leader of the Expedition was Dr. L. S. B. Leakey, Ph.D., well known for his work in the Naivasha region of Kenya Colony, and with him were Professor Hans Reck, of the University of Berlin, Captain J. R. H. Hewlett, and myself. At a later date we were joined by Mr. V. E. Fuchs and Mr. Donald MacInnes, so that eventually there were six Europeans with a native staff of about thirty, mostly Kikuyu, in the camp.

We left Limuru, Dr. Leakey's base camp sixteen miles from Nairobi, after lunch on September 22, and travelled along tolerably good roads to Maji Moto at the foot of the escarpment of the Great Rift Valley. This was only a few miles from home, but we camped there to make sure that everything was in working order. A trial run was essential, for we were to go over roads which were roads only in name, far from the resources of civilisation, and through country feared for its lack of water; country in which firewood is scarce, and water even scarcer; in which the only natives are the fiercely independent Masai, and even they are absent except during and just after the rains. Our convoy consisted of three lorries and a box-body car, all of the same make so that spare parts would be interchangeable; a precaution which was abundantly justified later.

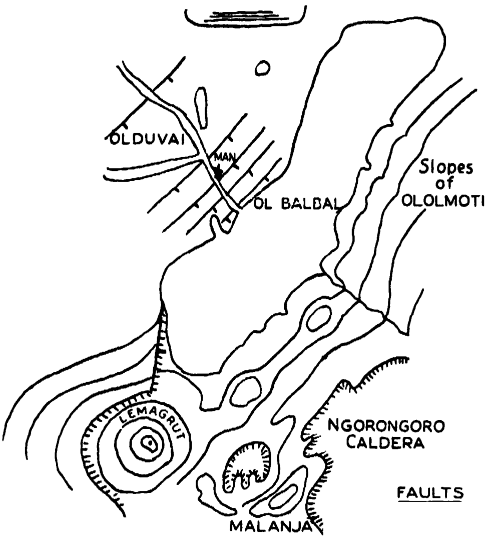


Fig. 1.—General Plan of the Olduvai Region, based on a sketch map by Reck. (Not to scale.)

The following three days we were on our way, camping each night at convenient water-holes. On the night of September 24 our camping ground was a reputed paradise for sportsmen and naturalists. Our information was that the granitic hills swarmed with leopards, and that lion and rhino were apt to become rather inquisitive. Actually we saw nothing at all, except guinea fowl, sand-grouse, jackals, and foxes; nor was our sleep disturbed except by the calls of a few hyænas. The next night we hoped to camp at Olduvai, but the fates were against us. Faulty ignition in one of the lorries delayed us, and we had to sleep in a dry korongo twenty miles short of our destination.

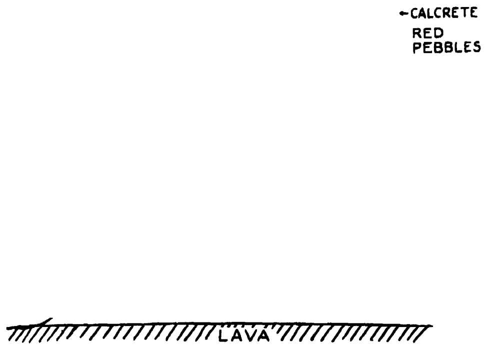


Fig. 2.—Section of Cliff where the Human Skeleton was found in 1913. (Not to scale.)

On Saturday, September 26, we arrived at the edge of the gorge known to the Masai as Ol Gedju Olduvai, the River of the Wild Sisal, and there we made our permanent camp. Our water was nearly exhausted, and that, perforce, was our first consideration. This was given into the charge of Professor Reck, with me as his companion. We set off at once to investigate a water-hole, from which he had been able to supply all the needs of his native labour during his expedition of 1913. The water seeped out of the ground at the base of a cliff of black, basaltic rock about thirty feet high. Like all the ground water in that neighbourhood, it was alkaline, but generations of Masai cattle, as well as other beasts, had so fouled the ground that the muck thrown up by the spade was stinking. We had to condemn that source of supply out of hand, and to rely on another about twelve miles away in the Sonjoo Hills.

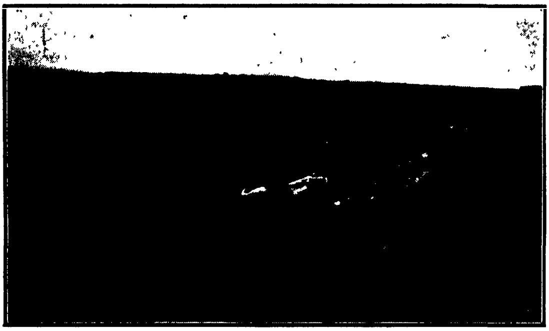


FIG. 3.—VIEW OF PART OF THE OLDUVAI GORGE.

In the afternoon we took the car with two boys in an endeavour to find a spring in a gorge on the western flanks of the highlands of the Giant Craters eleven miles away. With the aid of Reck's notes and photographs we were successful in our search, which was not devoid of adventure. There was the negative adventure of walking for the first time along a path in daily use by rhinos, not knowing when one might break cover and charge. There was also the more positive adventure of being overtaken by darkness whilst still over two miles from the car, and having to stumble along more rhino paths, keeping a sharp look out for marauding beasts. When at last we did reach the car, and were more than a third of the way home, the moon passed into a total eclipse with the result that we lost ourselves completely in a forest of umbrella acacias. The only thing to do was to stop where we were until the moon shone once more. Then we were able to continue on our way, arriving in camp after sundry other adventures between one and two o'clock on Sunday morning.

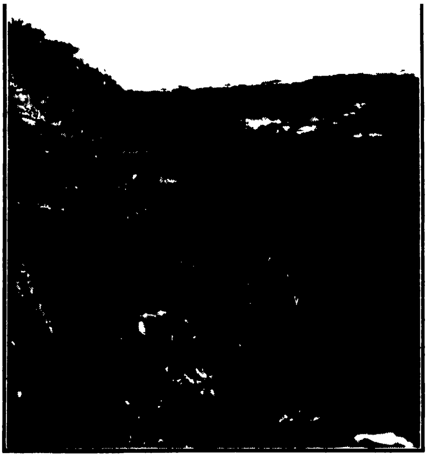


FIG. 4.—VIEW IN THE BOTTOM OF THE OLDUVAI GORGE.

Our camp was not fenced in any way; this gave us a taste of " life in the blue " which we might not otherwise have had.

Hyænas were nightly prowlers, the larder was often robbed by leopards, and visits by lions were not infrequent. One such visit was responsible for our most amusing experience.

Dr. Leakey had gone to Nairobi for stores, leaving Reck, Hewlett, and me in camp. For several mornings, just after sunrise, lions had been roaring a few hundred yards to the east of the camp, and when Hewlett went for his morning walk he took a rifle with him. On this particular morning he went down into the gorge away from the place where the lions were, but as he rounded a corner near the water-hole he was attacked by two fully grown males. The battle was sharp but short, and soon we were skinning both animals. That evening he and I decided to spend the night on a convenient ledge over the water to see what might turn up. Except for two hyænas our long night was unproductive. We watched the stars and heard all sorts of noises, such as the hoot of an owl, the yap of a jackal, the startled bark of a baboon, the death-wail of a small mammal, snufflings, heavy footsteps, and, twice, some heavy beast came lumbering along, only to retreat hurriedly over the stones. At last the moon rose, and the shadows became endowed with life and movement. The whole world was fey.

FIG. 5.—STONE IMPLEMENTS, WHICH HAVE FALLEN OUT FROM THE LAYER NEAR THE TOP OF THE SLOPE, LYING ON THE SURFACE AT OLDUVAI.

Then came the dawn. All the birds visited the water to drink. Small doves, weaver birds, and kanga, known to the uninitiated as guinea fowl, were the commonest. The doves and weavers arrived first in small flocks, and after them the kanga moving at a fast trot. They were excessively wild and hard to approach. Indeed, the general opinion was that to include guinea fowl among the birds was a grave mistake, and that they should be among the race-horses. Last of all, just as we were thinking of breakfast, came two lions, young males with short manes. Straight up the gorge they came, proud and arrogant in their demeanour, looking neither to the right nor to the left. Truly they were the representatives of the King of

Beasts. Yet there was a note of comic relief, for, twenty paces in the rear, they were followed by a tiny little dik-dik who was doing his best to emulate their bearing. Suddenly the lions saw us. They stood still, taking stock of the situation, and then retreated as leisurely as they had come. Not so the dik-dik. He stopped when the lions stopped, but when they turned he did not stay to inquire the reason.

Later in the day Hewlett went down again, and then much of the night's happenings was made clear. Whilst we were perched on our ledge looking down on the water for the animals which never came, the animals, lions, rhinoceros, and antelopes had been on top of the cliff looking down upon us!

Fig. 6.—Boys digging out Elephant bones. The *Dinotherium* teeth were found about 50 yards away. The pit is in Bed I.

Hyænas were plentiful at Olduvai, and, although a solitary beast is usually an arrant coward, a pack of them, if they are really hungry, is very much to be feared. At such a time even fire will not keep them off, and they will drive leopards and lions snarling and howling from their prey. One night Leakey had to withstand a charge from fifteen of the brutes when he was stranded with a broken-down lorry. Another night the camp was invaded in force. They were hungry and paid no attention to the lights we had left in certain tents to protect specimens and stores, but helped themselves freely. As a rule they will not enter a tent, fearing a trap; this time they not only walked all round the mess tent on the inside, but also visited tents in which people were asleep. A hyæna's laugh is not a reassuring réveillé.

Other adventures we had in plenty, as, for example, when Dr. Leakey was attacked by a rhinoceros, or another time when a lorry returning from a water-hole was charged by three lions as it passed between them and a herd of zebra they were stalking. Incidentally, the last episode was the cause of our seeing five rhinoceroses in as many minutes, four of them being within the field of the glasses at one time. Yet again, Hewlett and I were stranded for three days with a broken lorry in a place miles from any water. We only had five gallons for ourselves and two boys. Fortunately it rained each day. By collecting the rain-water we were able to carry on to our destination with the five gallons intact. That adventure involved a very fine piece of night driving by Mr. Fuchs. To tell all these stories, and many others, would take up the available space, and there are more important things to be considered.

Many thousands of years ago, at the end of the Tertiary period, Africa was convulsed by earth movements which resulted in the formation of a tremendous Rift, of which the Aberdare Mountains form a part. These movements were accompanied by intense volcanic activity represented to-day by extinct volcanoes such as Mount Kenya and Mount Kilimanjaro. In Tanganyika Territory the vulcanicity gave rise to the older parts of the highlands of the Giant Craters, namely Lemagrut, Ololbolong, and others.

FIG. 7.—EXTRACTING A HIPPOPOTAMUS SKELETON FROM BED IV. This is at the same level as the layer of stone tools shown in Fig. 5.

These mountains formed a dam which ponded back the waters of the first, or Kamasian, Pluvial period, and also furnished a thick flow of basaltic lava, which underlies the Pleistocene deposits of Olduvai. After a period of quiet, during which these volcanoes became extinct, there were more earth movements and fresh volcanoes were formed, such as Ololmoti and Ngorongoro. They furnished the tuffs which filled the waters of the lake held up by the first group, and which engulfed the bones of such animals as were swept into the lake, or died on its shores. As a final effort, the second series of earth movements gave rise to the Great Rift Valley of to-day. Later events led to the formation of the Olduvai gorge. Its mouth lies in Lat. 3° S., Long. 35° 25′ E., and it extends in an approximately S.E.-N.W. direction for nearly twenty miles (Fig. 1).

Exposed in the cliffs of the gorge are four main beds, lying on a thick flow of lava. The first, or bottom bed is known as

Bed I. It consists of silvery grey tuffs, with yellow pumiceous layers and concretionary bands. It is the thickest of the four, with very little earthy contamination, and its deposition, although discontinuous, was very rapid. To the east it is practically barren of fossils, but to the west it yielded crocodiles, antelopes, elephants, *Dinotherium*, the three-toed horse (*Hipparion*), and zebras.

Bed II is mainly buff-coloured. It is more massive and earthy than Bed I, with which it is entirely conformable. At the time it was deposited, the rainfall was of varying intensity, and extra wet seasons are represented by beds of pebbles. The fossils from this bed are much the same as those from Bed I, but we did not find *Dinotherium*, and in 1913 Professor Reck recovered a human skeleton from here.

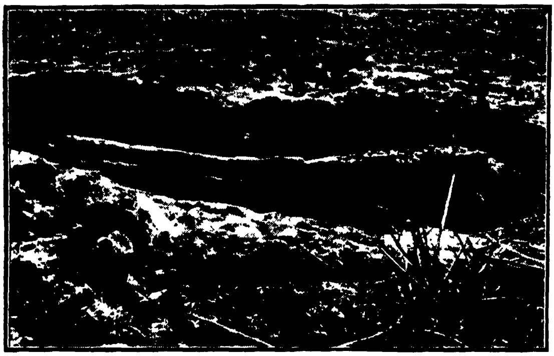


FIG. 8.—A TUSK OF ELEPHAS ANTIQUUS RECKI, READY FOR PACKING. It is about 8 feet long.

Bed III is the most useful for stratigraphical purposes owing to its bright red colour. It is conformable to Bed II, but dies out to the west. This suggests that the volcanoes were dormant, and their reddened decomposition products were washed into the lake from the east. The bed itself is hard and close grained, with occasional layers of pebbles and gravel.

Conformable to the last is Bed IV, a grey or brown bed, with a reddish phase in its western extension. It reflects in its structure and composition the gradual drying up of the lake. In a pebbly layer near the top we found an incomplete skeleton of a hippopotamus with over a hundred quartzite hand-axes lying on and among the bones.

Next comes a marked unconformity, followed by a complex series of deposits of wind-blown dust known collectively as Bed V.

The skeleton which Reck discovered in Bed II aroused considerable interest, but, when it was found that the animals were of Middle Pleistocene date, whereas the man was referable to the species *Homo sapiens*, the general opinion was that Reck had been misled by an intrusive burial of comparatively recent date.

Dr. Leakey's interest was attracted by the resemblance between this skeleton and others, of Late Pleistocene date, which he had discovered on the floor of the Kenyan Rift Valley. His anxiety to prove, or disprove, Reck's contentions, and to collect any stone tools which might occur in the locality was the immediate cause of our expedition.

We were very successful with the fossils and stone tools. Our finds made up a grand total of over one hundred cases of fossils, and from fifteen to sixteen hundred implements. In the nature of things we could not be so successful in collecting evidence regarding the skeleton, for all direct evidence was destroyed in the exhumation. From indirect evidence, however, we were satisfied that Professor Reck was right, and that his claims were well founded.

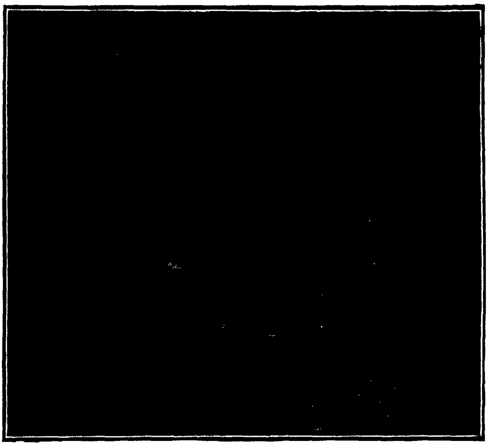


FIG. 9.—THE HORN-CORES AND BRAIN-CASE OF THE SPOTTED KUDU EXPOSED IN BED II.

The exact spot was easily identified from photographs, and the remains of a small shelter which had protected the skeleton during extraction. Before we moved anything careful photographs were taken; then a step-trench was dug up the face of the cliff so as to pass through Reck's original excavation. This confirmed the section shown in the diagram (Fig. 2). It proved that Bed II had been brought to the top of the cliff through earth movements, and all that remains of Bed III is a thin layer of red pebbles. The pebbles are covered by Bed V, which is capped by a thick layer of calcrete, or steppe-lime.

These red pebbles and steppe-lime are of the utmost importance in connexion with the possibility of an intrusive burial. They cover the slope of Bed II fairly thickly, and, in the case of an intrusive burial, it would be almost impossible to dig a shallow grave, and refill it, without including numbers of the pebbles and chips of steppe-lime in the filling. Now, Professor Reck has always maintained that there was no trace of foreign matter in the matrix. If we accept this, it follows that the skeleton must have arrived in Bed II before the deposition of

Bed III, and hence forms an integral part of the Middle Pleistocene fauna.

Apart from our work on the archæology, we made a valuable collection of fossils, mostly vertebrates. This collection supplements that made by Reck in 1913. First of all, we found that Bed I is richly fossiliferous in parts of the gorge which had not previously been examined; secondly, we found crocodiles and tortoises, neither of which had previously been recorded; and, lastly, in Bed I five complete teeth of the aberrant relative of the elephant, *Dinotherium.*

The elephant found at Olduvai is an African race of the Middle Pleistocene "Straight-tusked Elephant" (*Elephas antiquus*) of Europe, and is not ancestral to the modern African Elephant. In Bed I we had a pit from which we obtained numerous remains of this beast. Fifty yards away, on the other side of the gulley, but in the same bed, and at approximately the same level, the *Dinotherium* teeth occurred with numerous proboscidean bones, and a fragment of an elephant's tooth. This was proof that elephants and dinotheres lived at the same period. We thought at first that the bones were part of a skeleton of *Dinotherium*, but closer study at home has shown that we were mistaken, and that they are the bones of a young elephant.

Professor Reck found very few equine teeth; we were more fortunate, and were able to prove that *Hipparion* and a zebra, practically indistinguishable from Grévy's Zebra, lived side by side throughout the period of time represented by Beds I to IV. We also obtained horn-cores of Hunter's Hartebeeste, another fresh record, as well as many other antelopes, some of them new to science. Other important specimens are a complete skull of *Hippopotamus gorgops*, a palate, several mandibles, two tusks, and numerous other remains, of *Elephas antiquus recki*; a magnificent pair of horn-cores of the Spotted Kudu; a skull of a wildebeeste; as well as several partial skulls of rhinoceros, hyænas, and other animals.

It was impossible to live in this magnificent, if stern and cruel, country, without being impressed by the continuous changes going on around us. We were there at the end of the dry season, and through part of the "little rains." When we arrived the wait-a-bit and camel thorns were dry and leafless. At the end of the first fortnight they were showing small feathery green leaves. The bark of the camel thorn changed its colour, taking on a bright silvery hue. Certain gnarled, contorted, stumps threw out sparse leaves and covered themselves with bright pink flowers resembling some species of rhododendrons. One plant never changed. That was the *Sanseveria*, or Wild Sisal. Its stiff bayonets, disposed in pairs, never compromised, but made every attempt to pass through the waist-high thickets a matter of extreme discomfort, not to say danger.

The game was mainly in Balbal, a depression two or three miles to the east, under the shadow of the volcanoes. It included Thompson's, Grant's, and Roberts' Gazelles, the last being only a sport of the Grant, giraffes, and zebras. The carnivores were chiefly lions, leopards, and cheetahs, with hyænas, jackals, and bat-eared foxes. Up in the mountains were eland, impala, rhinoceros, and elephant were reported twenty miles away. For most of the animals the breeding season was past, and the youngest were several months old. At different times we caught a bat-eared fox, only a few weeks old, and a young klipspringer. As the rains drew nearer, a few wildebeeste wandered in, but the grass was poor owing to the long drought since April and the ravages of locusts; hence the main herds of game for which the Serengetti is famous kept far away to the westward.

FIG. 10.—SKULL OF AN EXTINCT HIPPOPOTAMUS IN BED IV.

With the birds it was different. Their breeding season seemed to begin with the rains. We found a young owl, fledged but unable to fly, nests of ostrich eggs and, later on, families of ostrich chicks. The plovers were hatching their eggs, producing marvels of protective coloration. Weavers were making their wonderful retort-shaped nests. Apparently they are local migrants, the cocks arriving in the breeding haunts before the hens. As soon as they arrive, they set about building nests, but I doubt whether these nests are ever occupied. Often when one bird has built his nest, he, or another, will weave a fresh nest to the mouth of that just finished, completely blocking the entrance. Strings of three or four nests joined together in this way were not uncommon. It seemed as though these "cock nests" were practice pieces, rather than homes for rearing a family.

Another curious thing about these nests was the great interest taken in them by a small green parrot (possibly a species of *Agapornis*), which would run about all over them, tear pieces out of them, look inside, and pass on. It might have been neighbourly curiosity, but the appearances were against it, and I suspect they were looking for eggs or young. Such random jottings might be continued almost indefinitely, for every day there was something new; small things most of them, but still of surpassing interest.

To bring this account to a close, mention must be made of the famous caldera, or subsidence crater, of Ngorongoro, the largest crater in the world. It is twenty-two kilometres across, and four hundred and fifty-six square kilometres in area at the bottom, with walls five hundred metres high. We climbed this twice. First of all Hewlett, MacInnes, and I took a car to within three miles of the crater rim. They went on to the top whilst I stayed behind to guard our possessions from wandering Masai, for we knew that bands of warriors were in the neighbourhood.

The second time Reck, Hewlett, and I with one boy left the camp at about eight in the morning. We made our way down to Balbal and along its western side looking for Masai graves. At last we found one, a low, elongated heap of stones, but the spirit of the old native bewitched our cameras, for we wasted seven films before we could get a satisfactory exposure. A little farther on we passed foxes sitting at the mouths of their burrows, wandering jackals, a hyæna or two. Soon we came to a dry korongo, in which were two ostriches with their brood only a few days old. Then we turned to the east to begin our climb. Up and up we went, occasionally stopping to cool the engine, and to look round, until we came to a small sunken plain under Malanja. This plain, filled with black cotton soil, revealed many things, which showed the geology of that corner of the mountains to be extraordinarily complicated. Then we carried on to a gap in the rim, whence a track leads down to the bottom of the crater.

The view was almost unbelievable in its beauty and variety. A huge, almost circular plain lay at our feet. To the north were a few small volcanic cones; in the centre a large, dry, lake of glistening white soda, with silvery dust-devils whirling over its surface; to the east, a big green swamp with *Hippopotamus* ; to the south a dense forest; in addition two or three streams, numerous wildebeeste, some Masai bomas, and over all a blue sky, flecked with white clouds. That is my most enduring memory of East Africa.

FIG. 11.—SKULL OF A NEW SPECIES OF ANTELOPE, STILL IN THE MATRIX. It was brought home, wrapped in plaster bandages.

In conclusion, it is a pleasant duty to acknowledge the cheerful alacrity with which everybody placed their services at our disposal; from the highest Government officer to the most ordinary native, they all did their utmost. It was largely owing to their help that our expedition was so successful.

A SHORT VISIT TO THE CONTINENT.

By Susan Finnegan, B.Sc., Ph.D., Assistant Keeper, Department of Zoology.

During a recent visit to the Continent I spent some time at Arnhem in Holland, working on Dr. A. C. Oudemans's collections. Dr. Oudemans has been for many years one of the acknowledged leaders in the study of mites, and his collection containing many thousands of microscopical slides is rich in various orders of Acari from many parts of the world. In Arnhem I was received with the greatest cordiality and kindness. It is a pleasant town, situated on the Rhine and, unlike the more northerly parts of Holland, surrounded by undulating, thickly-wooded country.

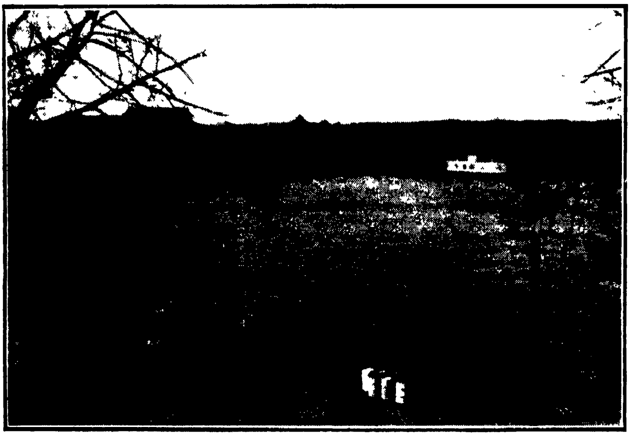


Fig. 1.—The Rhine at Arnhem, Holland.

An aquarium had been started in Arnhem about a year ago, but unfortunately the building was closed for cleaning during the period of my visit there. Adjoining the aquarium, however, were fish hatcheries, each pond measuring about 30 feet by 50 feet; we visited these and the accompanying photograph of Dr. Oudemans was taken there. Sturgeon, pike, salmon trout, and numberless elvers could be seen swimming around, and in one pond a net about four feet long had been submerged to a depth of one foot in the water; into this small compass it seemed as many salmon trout as could be fitted into the space were packed together. After we had remained quietly on the bank for a minute or so, we had the opportunity of having a " close-up " view of salmon trout leaping tirelessly into the air. While we waited none of them actually cleared the net, for those that leaped high enough had too vertical a direction and, like the others, fell back again into their cramped quarters.

The Zoological Gardens are a short distance out of Arnhem. Mr. J. G. H. Burgers, who owns a large estate on the outskirts of the town, had, after years of collecting, formed a private zoo, which he had been persuaded to enlarge and throw open to the public. The number of exotic birds is the outstanding feature, but the whole gardens are most attractively laid out with a minimum amount of interference with the natural surroundings, which in themselves are very favourable to the venture.

FIG. 2.—DR. A. C. OUDEMANS AT THE FISH HATCHERIES, ARNHEM.

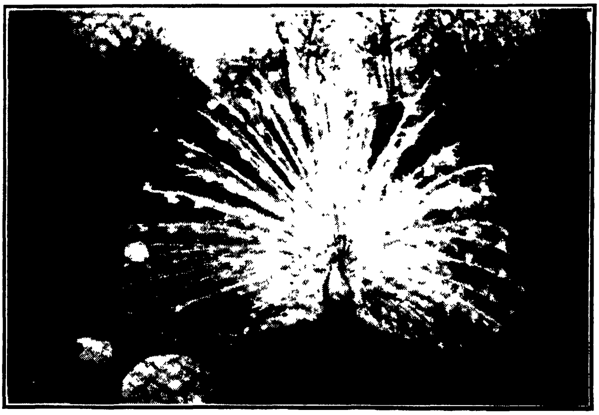


FIG. 3.—WHITE PEACOCK, ZOOLOGICAL GARDENS, ARNHEM.

An unusual exhibit is the tableau in the wolf's enclosure, illustrating "Little Red Ridinghood." A little house, with the Grandmother sitting at the window, occupies a prominent position in the centre, and Little Red Ridinghood is seen approaching the door with her basket of provisions. This exhibit is undoubtedly popular with children, but it may be questioned whether the principle is to be recommended for imitation.

The monkeys are equipped with all the apparatus of a gymnasium, and Mr. Burgers has his own version of the Pied Piper to present. During my visit a bell was rung at some distance and at the same instant a hole just large enough to admit one monkey at a time was opened on the face of a very steep and slippery boulder. Instantly the monkeys, which a moment before seemed to number fifty or sixty, formed an innumerable and endless procession of scampering limbs and tumbling bodies. Nothing less than half a length through the opening assured an entrance, for the urgency of the situation demanded that, while the animal with only head and shoulders in should be dislodged with all haste, the animal that was three-quarters way in would be more quickly dispatched by a vigorous push from behind. It took the monkeys a very short time to discover that no dinner was forthcoming, but this did not seem to disturb the firmly established "conditioned reflex," which displayed its full force the next time the bell was rung.

Fig. 4.—" Fritz " the Lion, Zoological Gardens, Arnhem.

From Arnhem to Leiden and Amsterdam was the programme for one day, and the journey led through a variety of scenery. As soon as the wooded uplands near Arnhem disappeared from view, the train ran through very typical Dutch country, and from Utrecht to Rotterdam one had ample opportunity of seeing the system of irrigation; every few yards small canals leading into larger ones crossed the fields in regular lines, forming oblongs or squares as far as one could see, and the villages looked exceedingly picturesque with their broader canals and wooden bridges seen against

Fig. 5.—" Little Red Ridinghood " scene, Zoological Gardens, Arnhem.

the dark red brick of the houses. From the Hague to Amsterdam the route lay through the heart of the tulip-growing country. In every respect luck seemed favourable: the flowers were at their best and the sun shone brilliantly with reflected sheen over the acres of scarlet and gold. Van Hasselt's types of spiders are stored at the Museum at Leiden, and I had an opportunity of seeing not only the type specimens of a species of *Liphistius*, one of the most primitive spiders, but also the fine storage accommodation of that Museum.

At Amsterdam the Natural History Museum is within the grounds of the Zoological Gardens, and this close association seems to have much to recommend it. One of the most interesting exhibits in the Museum has been only recently installed. A large semicircular room, of 13 metres radius, which was formerly used as a lecture theatre, has been converted into the scene of an excellent representation of sand dunes of the northern coast of Holland. A well-known Dutch landscape painter, Mr. W. G. F. Jansen, has painted the background, while the actual specimens of the flora and fauna are skilfully arranged by Mr. P. L. Steenhuizen, the taxidermist of the Museum, and merge so easily into the painting that no break in the continuity is apparent. The perspective seems perfect, and the illusion is further intensified by the arrangement of the glass in front, which instead of being cut off in a straight line has a large straight central portion and two sides obliquely inclined, like a bay window, so that on walking from one side to the other one has the sensation of actually walking on the sand dunes; one catches glimpses of the scene from different angles. An unobtrusive screen overhead cuts off the top of the background, and the difficulty of merging it into the horizontal level is thereby overcome. For an

FIG. 6.—ZOOLOGICAL GARDENS, ANTWERP.

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FIG. 7.—LEFT OF SAND DUNES SCENE, NATURAL HISTORY MUSEUM, AMSTERDAM.

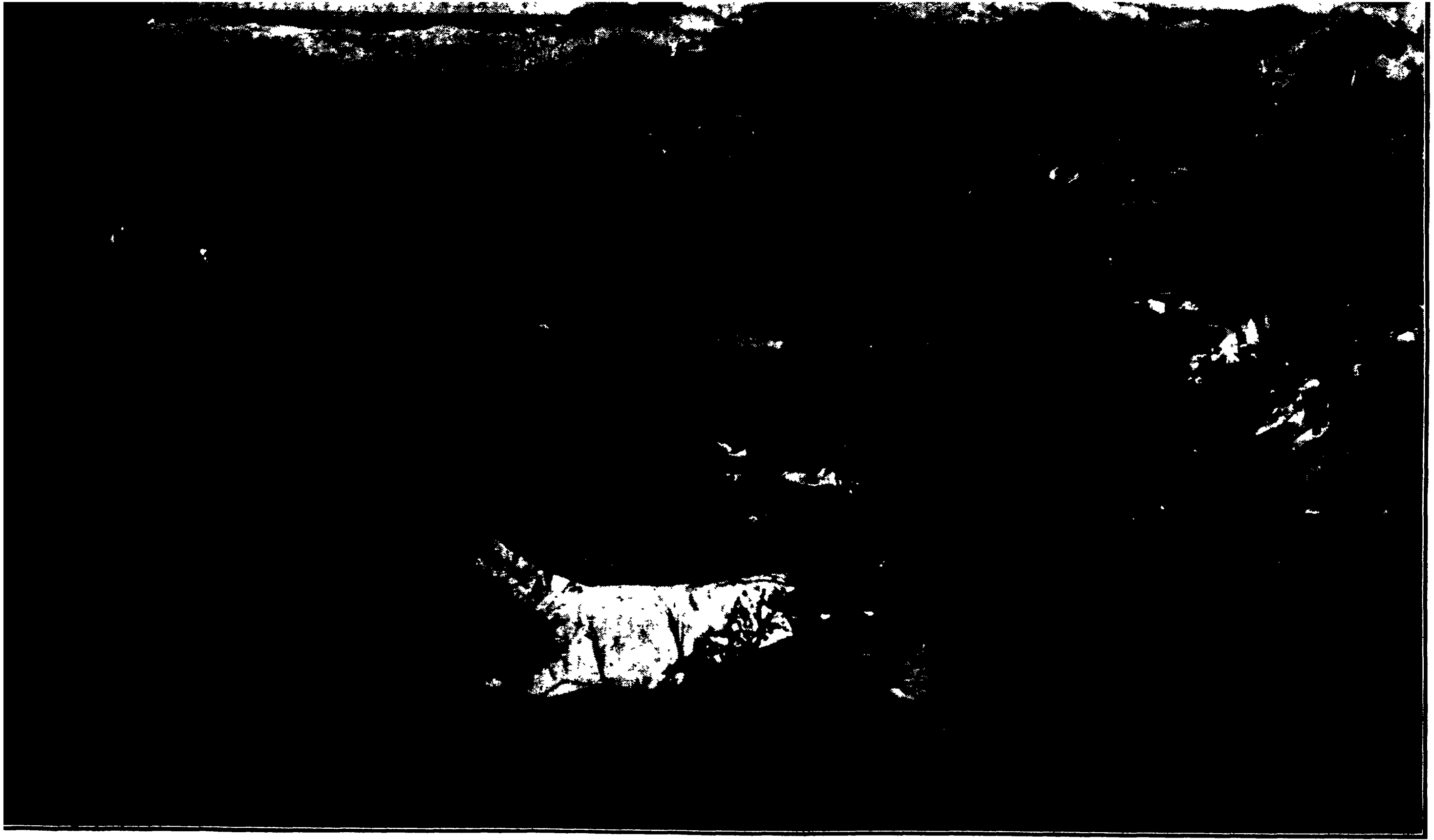

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FIG. 8.—CENTRE OF SAND DUNES SCENE, NATURAL HISTORY MUSEUM, AMSTERDAM.

exhibit of this description the semicircular background has many advantages.

From Amsterdam to Brussels the traveller passes through Antwerp, where it is easy to visit the Zoological Gardens between trains as station and Gardens adjoin; indeed, the large space where goats, deer, and bisons wander at will is cut off at the far end by the station wall.

The Museum at Brussels is happily situated in the Parc Léopold. The invertebrate galleries are housed in a new building, and it was interesting to observe the effect of modern lighting and the arrangement that is adopted in the room; the cases stand in tiers one above the other with narrow gangways between. So far as I observed, this large room is entirely filled with systematic series. The most striking sight is undoubtedly the imposing hall with the rich fossil vertebrate material. The great wealth of fossil reptiles has made it possible to arrange the famous display of Iguanodons just as they were found in the ground by the excavators. Beside these remains, reconstructed specimens are shown, and the scattered parts lying on the ground can be compared by any person studying them.

I arrived in Paris a few days after the assassination of the French President and was much impressed by the universal sorrow and mourning of the people. At the Natural History Museum I was received with the utmost kindness and consideration and saw Dr. André's fine collection of Trombidiid mites, the group that comprises the well-known "Harvest Bugs." The scientific institutions in Paris are so conveniently situated with regard to each other that even in the short time available I was able to visit the Faculty of Science of the University and also the Institute of Parasitology, where experiments are being carried out on the transmission of disease by ticks.

Of all the varied impressions that one receives on a visit of this description, the most vivid is the eagerness to help and the kindness and hospitality extended by all one's foreign colleagues.

VOLCANIC DUST FROM THE SOUTHERN ANDES.

By W. Campbell Smith, M.C., T.D., M.A., Deputy Keeper, Department of Mineralogy.

The recent eruptions in the Andes on the Chilean-Argentina boundary were remarkable for the enormous quantities of volcanic dust which were ejected and carried over a very wide area, reaching even as far as Buenos Aires and Montevideo, 800 miles from the scene of the eruptions.

The eruptions commenced in the morning of April the 10th. The volcanoes reported active were Tupungato, Overo, Tinguiririca, and Peteroa, in the province of Mendoza (Argentina), and Descabezado, Las Yeguas, and Quizapu in the province of Linares (Chile). Tupungato (21,810 feet) is some 45 miles south of the better known volcano of Aconcagua, and lies approximately east of Santiago. The distance, from north to south, between Tupungato and Quizapu is about 200 miles. The eruptions continued to be violent for three days. During all this period a dense cloud of dust hung over all the country near the volcanoes, and volcanic ash and fine dust rained down in enormous quantities. Aeroplane observers flying over some of the active craters reported very frequent loud explosions, great blocks of lava being hurled more than 200 feet above the crater and appearing to shatter in mid-air. Our illustration (Fig. 1), reproduced by kind permission of " The Times," was taken by

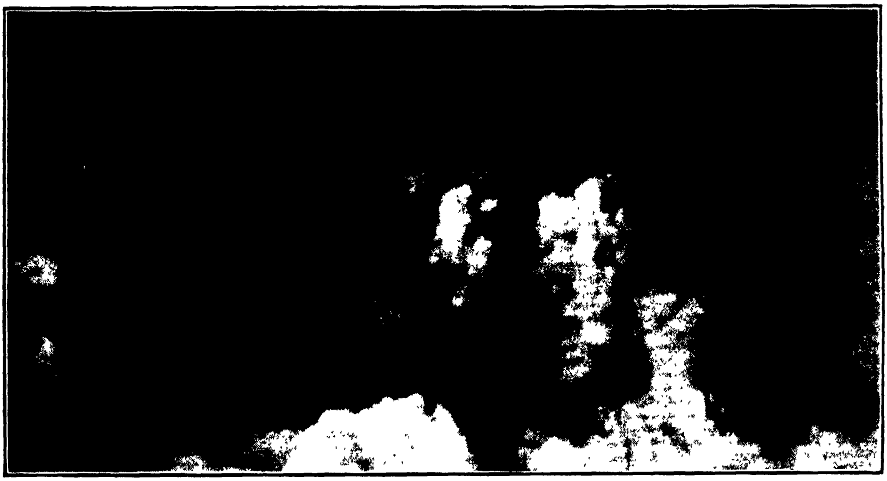

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Fig. 1.—Volcano in Activity.

On the left of the picture the crater of Descabezado can be faintly discerned with great clouds of smoke from Quizapu on the right.

one of these aeroplane observers. It shows the crater of Descabezado (on the left of the picture) and the great clouds of dust pouring out from the crater of Quizapu.

The dust fell on both sides of the Andes, but the cloud was much heavier and travelled to much greater distances on the eastern side. On the western side it covered the country from Santiago to Talca with a layer sometimes more than two inches thick. Pictures published in "The Times" of April the 27th show children shovelling the white dust into sacks in a street at Curico, some 50 miles west of the volcanoes. On the eastern side in the province of Mendoza, and especially in the district of San Rafael, 80 miles east of the volcano Overo, the thickness of the dust layer was much greater. In places as much as three feet were reported, and trains going to the relief of the stricken area were held up. The finest dust travelled the whole breadth of Argentina, covering Buenos Aires with its pall, and reaching as far as Montevideo.

The Museum has so far, received two samples of the dust, which are the more interesting in that they were collected from almost the extreme ends of the area affected. The first to be received was kindly presented by " The Times." This sample, 3 grammes in weight, was collected on the Chilean (western) slope of one of the active volcanoes. It was sent from Santiago on April the 18th to Pernambuco, and thence to Europe in the airship " Graf Zeppelin." This was briefly reported on by the Museum in " The Times " of May the 16th. The second sample, presented to the Museum by the Nelson Steam Navigation Company, is of dust which fell on the decks of the Nelson Line steamship "Murillo," which reached Buenos Aires on April the 11th. This was collected by the Chief Engineer, Mr. G. H. Taylor, who gives his impression of the dust cloud as follows ;—

> "On April 11, at 0.23 a.m., when about 100 miles from Buenos Aires the effect of pumice in atmosphere was first noticed, and in appearance gave the impression of fog, although for about 200 ft. above water, the atmosphere appeared to be clear as lights were easily visible.
>
> At daybreak found ship covered with fine grey pumice; sun completely obscured similar to a dense grey fog lifted some 200 ft. above water.
>
> On arrival in Buenos Aires at 2.45 p.m. found similar conditions prevailing, the town being completely covered with a grey mantle of pumice which drifted about like fine snow.
>
> On April 12 similar conditions prevailed at first, but towards late afternoon the atmosphere became clearer, the sun being faintly visible at times, looking like a red sphere, clean cut with no rays; by noon on the 13th practically everything became normal.
>
> This pumice-dust was only visible in particles to the naked eye when falling against a dark blackground, it being so fine that it penetrated into every hole and corner in the interior of buildings."

The chief constituent of the dust is a nearly colourless volcanic glass, for the most part in the form of pumice. With this are mingled minute chips of plagioclase felspar (andesine), magnetite, dark green hornblende, augite, and hypersthene. The total of these minerals probably does not exceed 15 per cent.

The two samples examined have similar general compositions, but they show minor differences which are of interest as they can be directly related to the great distance separating the localities where they were collected. In the sample from the western slopes of the volcanoes, collected within 50 miles of the zone of activity, there are very numerous rounded grains of pumice half a millimetre in diameter. These are so crowded with minute air bubbles that they are quite opaque in transmitted light and white in reflected light. With these are chips of colourless glass and pumice, and grains of all the minerals mentioned above, varying in diameter from one-fifth of a millimetre downwards, the most frequent size being about 0·15 mm. Of the constituents other than glass the plagioclase felspar is the most abundant and may account for about 10 per cent. (by volume) of the dust. Magnetite constitutes about 1·25 per cent. by weight. Hornblende, enstatite, and augite are present in rather smaller amount.

In the second sample, collected by Mr. Taylor on s.s. "Murillo" at Buenos Aires, there are none of the rounded grains of pumice. The chips of volcanic glass rarely exceed one-tenth of a millimetre in diameter, but many of them are full of air-bubbles proving their origin from the pulverization of the pumice. The mineral grains are smaller still, ranging in diameter from 0·08 mm. downwards, and are less abundant than in the other sample. The relative proportions of the minerals has also changed. Plagioclase felspar is still the most abundant; next comes hornblende, as minute cleavage flakes, then magnetite (rare) and lastly the pyroxenes (very scarce). This redistribution of the mineral components of the dust is directly related to their difference in density. The felspar, the lightest (density 2·7) has travelled best, while magnetite, the most dense (density 5·2) has fallen rapidly, and is now less abundant than the hornblende (density 3·0–3·4). The hornblende has travelled better than the pyroxene of about the same density because it occurs as minute flat cleavage flakes, while the pyroxenes are present as little prismatic crystals often weighed down by adhering magnetite.

The sorting out of the denser minerals from far-travelled volcanic dust was explained by Professor J. W. Judd in the report on the eruption of Krakatau in August 1883. This eruption, which was one of extraordinary violence, was also remarkable for the vast quantities of volcanic dust which were ejected. The dust of Krakatau is very similar in composition to the samples described above, and consists mainly of pulverized pumice. The actual formation of the dust was attributed by Judd to the pounding of masses of pumice as they were hurled about by the repeated explosions. The dust was shot up to enormous heights, estimated by one observer at seventeen miles, and it is believed that the finest particles, remaining suspended in the atmosphere, were responsible for the brilliant sunsets observed in England in the following winter. In an article in *Nature* (April 23, 1932, p. 604) Dr. Charles Davison has discussed the possibility of the dust from the Andean eruptions producing similar effects. It seems doubtful whether these eruptions, much less violent than that of Krakatau, will have shot the dust cloud to sufficiently high altitudes.

RECENT BRITISH EARTHQUAKES.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

During the last three months only one earthquake has disturbed these islands, or at least only one has been sufficiently pronounced to be recorded. Shortly after midnight (Summer Time) on May the 26th a slight earth tremor was felt in the Sheffield district, and a few accounts of it have been recorded. In the city of Sheffield several persons were alarmed by the rattling of crockery in their houses and the sound of " a rushing wind " without. A resident at Thornhill, near Bamford, in the Hope Valley, said that he was wakened by a noise which he likened to a passing train or a rushing wind. The noise soon died down to a whisper but the house was shaken.

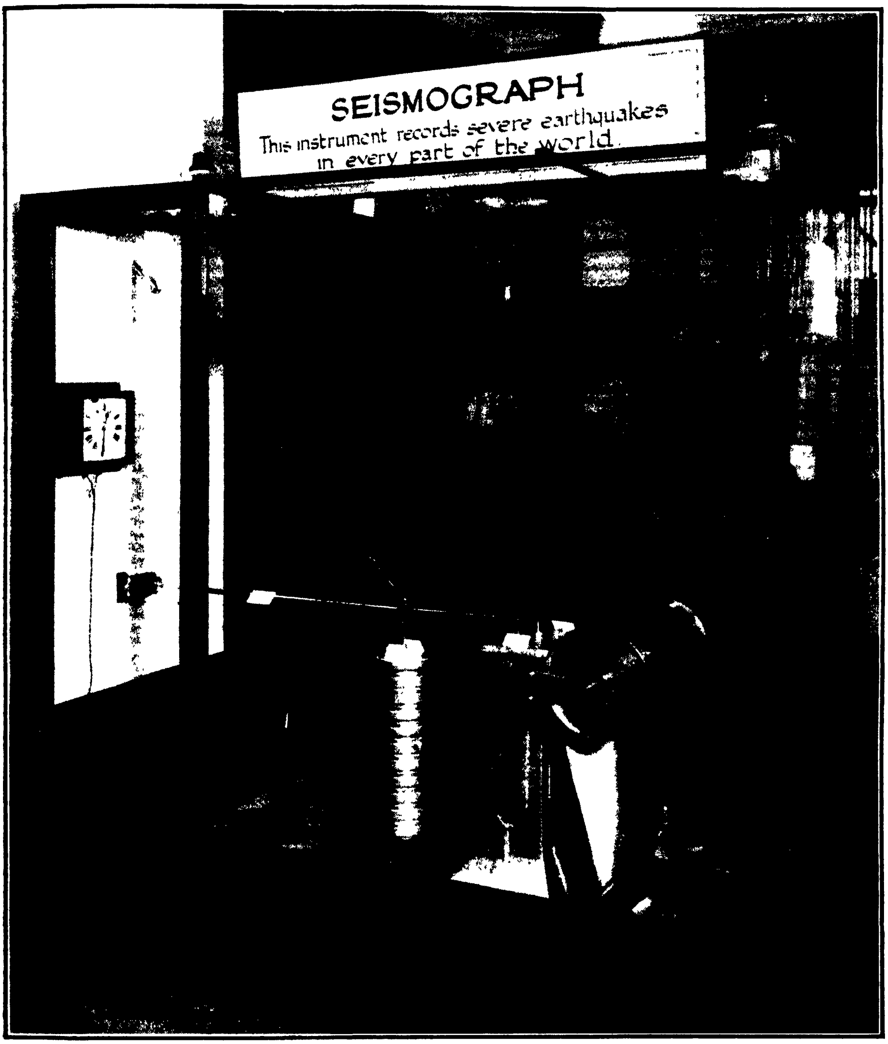
At Stannington, also near Sheffield, it is recorded that " an empty beer-barrel was shaken off a gantry in a licensed house."

At Endcliffe a man was awakened by a noise like the banging of a door, while in the same house a woman who had been asleep left her bed because she feared the walls would fall.

No damage was done in the district.

The details of such occurrences often look amusing in cold print, but every indication of movement and of noise associated with the tremor is important, as it gives a clue to the strength of the shock at various places, and thus helps to indicate both the intensity and the epicentre of the occurrence. From the data given above the tremor, or tremors, would appear to have been of intensity 4 on the Rossi–Forel Scale.

At the time of the occurrence the Midland counties were suffering from severe floods, and it is only natural that the earth tremors should be attributed to the effect of these waters on the underlying rocks. There is no doubt that such widespread flood-waters do occasionally produce minor and very local readjustments of strata, particularly in limestone districts. The Sheffield


SEISMOGRAPH
This instrument records severe earthquakes in every part of the world.

Reproduced by courtesy of Selfridge & Co., Ltd.

FIG. 1.—HORIZONTAL PENDULUM SEISMOGRAPH.

district is, however, the site of a large number of faults, adjustment along some of which would adequately explain the recent shocks. One of these faults runs through both Stannington and the northern part of the city of Sheffield, while both Bamford and Endcliffe are near associated faults. The earth-tremors were thus very probably due to fault movement and not to floods.

The suggestion that the floods were responsible is interesting because it at once recalls the theories of the Greek philosophers to explain earthquakes. They believed that the earth was a disc floating upon water, and Thales (620–560 B.C.) attributed earthquakes to the turbulence of the underlying waters, which forced open fissures in the earth and óccasionally even passed through to the surface. Anaximander, a pupil of Thales, held that in times of drought or of floods the surface of the ground cracked open and the air above forced its way into the fissures with violence. Again, Anaximenes, who was the pupil of Anaximander, thought that when the ground became softened by persistent rains and floods great blocks fell into the waters beneath.

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FIG. 2.—SEISMOGRAM OF MEXICAN EARTHQUAKE, JUNE 3, 1932.

The length of the curved line measures the intensity of the shock at the particular moment.

Now, in a more enlightened age, the causation of earthquakes is not the concern merely of the philosophers, but is a subject of interest to the ordinary individual. It may therefore be of interest to mention that a great London Store, that of Selfridge & Co., Ltd., has installed a seismograph in one of its departments. Here the machine can be seen in action at any time the store is open. Already several earthquakes have been recorded and the seismograms are also on view. The seismograph is a comparatively simple one and clearly shows the method of recording (Fig. 1). It is a horizontal seismograph, somewhat similar to the Omori horizontal pendulum. The boom is swung from the pillar on the left and its excessive movement is damped and the effect of friction of the recorder is lessened by the suspended weight, or bob, of three hundred pounds. The boom is connected with an axle which in turn manipulates a light aluminium rod which gently traces a path upon the smoked paper on a revolving drum. The drum revolves slowly and a time marker, connected with a clock, marks off measured periods of time upon the edge of the paper nearer the observer. The duration of a tremor can thus be accurately noted. This type of machine records only the shock component of one direction. As the rod or boom is orientated in an E.–W. direction it follows that the N.–S. component is recorded. Normally the pointer traces on the smoked paper a thin white line but a shock causes oscillation, producing a record like that in figure 2, which was obtained from the Mexico earthquake of June the 3rd.

EXHIBITION OF THE GAME ANIMALS OF THE EMPIRE.

By J. Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

On May 31st the exhibition of the Game Animals of the Empire in the new Whale Gallery was opened to the public; on the preceding day a Private View was held, which was attended by some distinguished sportsmen and others.

Owing to the economic situation it was not found possible to instal the whales into the new gallery recently built for their reception, and it was therefore decided to use the gallery for a temporary exhibition of the game animals of the Empire, the specimens for the most part to be drawn from the permanent collection without seriously depleting the exhibition series.

As space was strictly limited, it was obviously impossible to deal with the game animals of the whole Empire, and accordingly the countries where the most attractive animals are found were selected. Thus, Canada and Newfoundland, the African parts of the Empire, and the Indian and Malayan countries are alone represented, each of these areas being dealt with as a separate unit.

The mounted animals are arranged in three enclosures on the floor of the gallery, while on the walls around hang a large collection of heads and horns together with pictures and photographs of various game animals. The Indo-Malayan section was found to be the most difficult one to arrange, on account of the great number of large animals occurring in this area. It was not found possible to exhibit whole mounted specimens of the Indian Rhinoceros, the Markhors or the Banting, but heads and skulls of all these are on the walls. As the Museum collection does not contain a mounted specimen of the Indian Lion, this species had to be omitted from the exhibition. The following are among the animals exhibited in the Indo-Malayan enclosure: Sumatran Rhinoceros, Javan Rhinoceros, Gaur, Seladang, Kiang, Tapir, various Sheep, Gazelles and Deer, Nilgai, Yak, Takin, Serow, Goral, Blackbuck, Four-horned Antelope, Pigmy Hog, Tigers, Snow Leopard, Chita, Bears and Cats. On the walls surrounding this enclosure are some of the finest heads in any collection, the series containing many record specimens, such as the record Shou, Yak, Chiru, Indian Buffaloes, Indian Rhinoceros, Javan Rhinoceros and Sumatran Rhinoceros.

The African section, naturally the largest in the exhibition, has for its centre-piece a white variety of the East African Giraffe lent by Messrs. Rowland Ward, Ltd. The animals are arranged in this enclosure, as far as possible, according to the map, but obviously in cases where an animal is distributed all over Africa, only a single specimen is exhibited. The following well-known animals are exhibited in this section: Lion, Leopard, Serval, Caracal, Civet, Hyæna, Hunting Dog, Buffaloes, Hartebeests, Bastard Hartebeests, Gnus, Duikers, Klipspringers, Oribis, Sunis, Reedbucks, Waterbucks, Kobs, Lechwes, Roan Antelope, Gemsbuck, Bushbucks, Nyala, Situtunga, Giant Eland, Wart-Hog, Bush-Pig, Forest-Hog, Zebras and Rhinoceroses. On the walls around and on the wall at the west end of the gallery are grouped together a magnificent collection of African trophies, containing many record heads and other fine specimens. Among these may be noted some fine buffalo heads and the record nyala. Of special interest is a rhinoceros horn lent by Lord Rothschild, which would appear to be as much like the horn of a Black Rhinoceros as it is like that of the White species.

The Canadian and Newfoundland enclosure is rather more empty than that of Africa or the Indo-Malayan section, owing to the fact that game animals are less numerous in these western areas. Here we have grouped together the Grizzly, Alaskan and

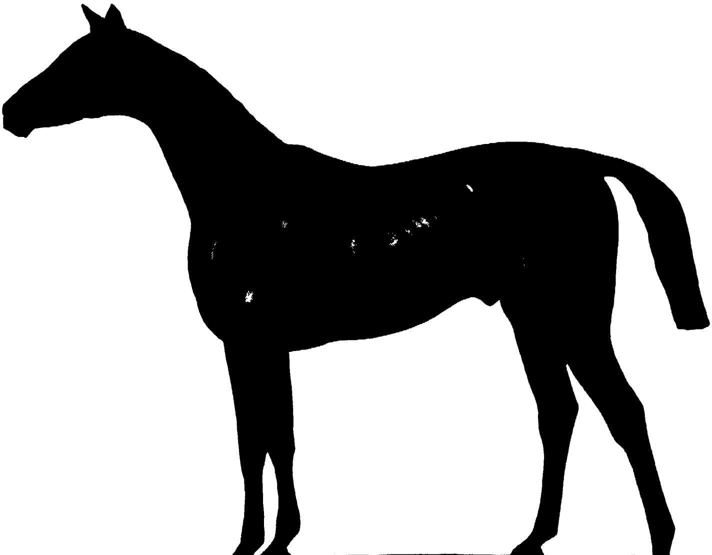
Black Bears, the Puma, Lynx, Bay Lynx, Wolves, Foxes, Racoon, and from the far north, the Polar Bear. The ungulates are represented by the Bison, Big-horned Sheep, Rocky Mountain Goat, Pronghorn, Moose, Caribou and Mule Deer. On the walls are very fine collections of American and Newfoundland trophies, *including the record specimen of Newfoundland Caribou.*

The pictures exhibited are, for the most part, the work of J. C. Dollman, R.W.S., and have been kindly lent by the artist, and the photographs are those taken by Lady Broughton, Mr. Marcuswell Maxwell and Mr. Marius Maxwell.

NOTE ON THE STATUETTES OF THE RACEHORSES "PERSIMMON" AND "CLOISTER."

By J. Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

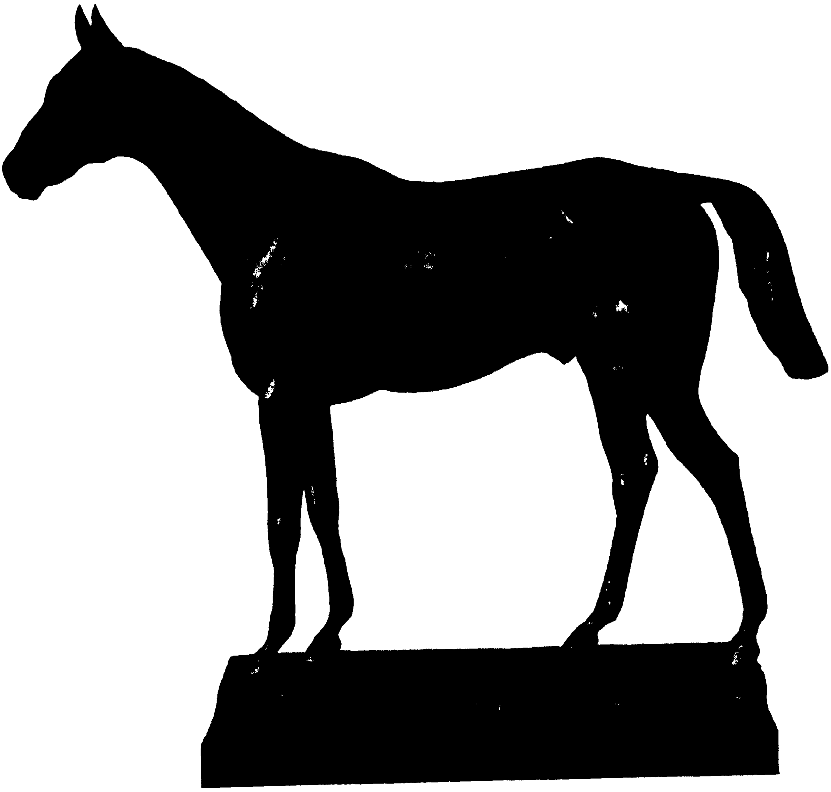
Two interesting statuettes of racehorses were recently presented to the Museum by Captain Adrian Jones, the eminent sculptor. The statuettes, which are the work of Captain Adrian Jones, are of the late King Edward's horse "Persimmon,"



Statuette of "Persimmon."

winner of the Derby in 1896, and of " Cloister,' winner of the Grand National in 1893.

The statuette of " Persimmon " is of exceptional interest, as it represents the horse at the zenith of its racing career. The Museum already possesses a plaster figure of " Persimmon " made by Captain Adrian Jones *during the latter part of its life*



STATUETTE OF " CLOISTER."

and presented by King Edward in 1905. King Edward also presented the skeleton of this famous horse in 1910.

" Persimmon " was not only a Derby winner, but the same year as it carried off the " blue ribbon " of the turf it also won the St. Leger, and the following year (1897) captured the Ascot Gold Cup and the Eclipse Stakes.

BOOK NOTICES.

T. H. Huxley as a Man of Letters. By Aldous Huxley. Pp. 28. (London: Macmillan & Co., Ltd. 1932. 1*s.*)

To entrust the Huxley Memorial Lecture delivered at the Imperial College of Science and Technology on May 4, 1932, to the literary grandson of the illustrious man commemorated was a bold experiment on the part of the Lecture Committee, but one that was crowned with success. The matter composing it was of unusual interest, and seldom has a lecture been so well delivered; those who had the privilege of being present were held enthralled from start to finish.

The charge has often been levied against the scientist of to-day that he is unable to lay what he wants to say before his readers in pleasing and lucid language, and the charge is often but too true. An article or a memoir is apt to be written in a jargon and common words are at times misused so that the precise meaning intended to be conveyed is uncertain. It is the disadvantage resulting from the ever-widening bounds of knowledge that there is in any field of it so much ground to cover and so little time in which to do it; consequently literature too soon ceases to form part of the curriculum of studies of the budding scientist. In Huxley's day those enjoying an education were nursed on literature whatever path in life they were expected to follow. We therefore find in the writings of scientific investigators then a style and a vigour that few such today can emulate.

The lecturer made many good points. " Except, then, for the historians of science, nobody studies at first hand those contributions to knowledge to which the great discoverers of the past owe their scientific reputations. By what seems a strange paradox, the older scientists survive mainly as artists." " All communications are literature; but their potentialities for beauty are unequal. A good account of deep-sea fish can never be as richly, variously and subtly beautiful as a good poem about love. But, on the other hand, a bad account of fish can probably never be so monstrous as a bad love poem." ". . . the man of letters does most of his work not by calculation, not by the application of formulas, but by æsthetic intuition. He has something to say, and he sets it down in the words which he finds most satisfying æsthetically." Much the same as the last aphorism may be said of the cultured musician.

In this short pamphlet the lecture is brought before a far larger audience than could be accommodated in the largest lecture-hall. The price is small: great should be the demand.

The Film in National Life, being the report of an Enquiry conducted by the Commission on Educational and Cultural Films with the service which the Cinematograph may render to Education and Social Progress. Pp. xii + 204. (London: George Allen and Unwin, Ltd. 1932. 1*s.*)

This interesting and valuable report represents the result of the labours of the unofficial Commission which was set up under the chairmanship of Sir Benjamin Gott by the unanimous vote of a conference of representatives of some hundred educational and scientific organizations, including the Natural History Museum, which was convened in November 1929. The report consists of ten self-contained chapters—The position to-day; The film in other countries; Censorship and control; The film as a craft and an industry; The education of the child; The entertainment of the public; The education of the adult; The film in documentary record and science; The cinema and the Empire; The constitution of a film institute and summary of the report—and ten appendices, together with an index at the end. It culminates in the recommendation that a National Film Institute be set up in Great Britain financed in part by public funds and incorporated under Royal Charter.

It is clearly not our province to argue for or against the founding of such an institute. We may, however, unequivocally commend the report to the notice of anyone seeking an epitome of the information on the provision of educational and cultural films throughout the world. The low price at which the report is on sale brings it within everybody's reach. The service of the Museum does not as yet include the use of cimenatography; but whenever a lecture theatre is built it will certainly contain provision for the display of films dealing with natural history subjects. In the present unfavourable financial condition it is very doubtful how soon such a building will be planned, much less begun.

The Journal of Animal Ecology. Vol. 1, No. 1. Edited for the British Ecological Society by CHARLES ELTON (Editor) and A. D. MIDDLETON (Assistant Editor). Pp. 100, with 10 illustrations on 5 plates. (Cambridge University Press. 1932. 22*s.* 6*d.*)

THE British Ecological Society and Mr. C. S. Elton are to be congratulated on their courage in bringing out a new journal at a time like the present, and we sincerely hope that their confidence will be rewarded by a substantial list of subscribers. More especially, however, they are to be commended for giving the increasing number of workers in animal ecology a journal of their own. A glance at the abstracts originally published in the " Journal of Ecology " shows that numerous periodicals accept papers wholly or partly of an ecological nature; but the subject is attracting more workers and is capable of expansion. Moreover, as stated in the foreword, it seemed to be running " a real risk of becoming split unnaturally into isolated compartments of knowledge attached to special scientific and economic spheres." Ecology is a meeting ground, it is true, of many branches of biology—systematics, physiology, etc.; but it has specific interests of its own. Its publications require to be centralized and it needs a journal in which it can formulate its own tradition.

At present the many ecologists in this country are paying special attention to the numerical fluctuations in the natural populations of animals. Four of the seven papers in the first number of the new Journal bear on this subject either directly or indirectly. Other important problems dealt with are migration, variation in food, " territory," etc. The Journal contains also useful abstracts, reviews, and notes. The plates and figures are excellent, and the printing and editing are very good. Indeed, the only misprint we have noted is touched with imagination; for Professor Orton surely ought to be gratified by his new splendour as " Orion."

A Naturalist in the Guiana Forest. By Major R. W. G. Hingston, M.C., M.B. Pp. xiii + 384, with 16 plates and 150 text figures. (Edward Arnold & Co. 1932. 18*s.*)

THIS book is the first fruit of the Oxford University expedition to British Guiana, which left England in 1929. Its author, the leader of the expedition, has already become known as one of the best living observers and interpreters of the lesser forms of animal life and his latest work will increase his reputation.

The book is in two parts. The first contains a general account of the objects of the expedition and the methods adopted to achieve them, together with a vivid description of the forest country through which the Essequibo

River runs, and its fauna and flora. A principal object of the expedition was the study of the zoology and botany of the tree-tops—the roof of the forest—a region hitherto almost unexplored in any part of the world. The gloom, stillness, and apparent emptiness of life of the forest depths are graphically described and contrasted with the flowery luxuriance and animation of the roofing canopy, the average height of which is placed at 100 feet. Owing to the frequent inundation of the ground, the forest fauna is almost entirely arboreal and the few exceptions among the vertebrates are more or less amphibious. Interesting records were kept of the changes found to occur in the insect fauna at different elevations above the ground.

> "It was demonstrated clearly and without exception that moths dominated the night fauna on the ground and hemiptera in the forest-roof. But the point of particular interest was that many of the moths of the tree-roof at first sight looked as if they were hemiptera. They mimicked the dominant fauna of the canopy and by doing so secured protection."

The pioneer work of the expedition in studying the abundant life of the forest-roof, the results of which are as yet only beginning to be worked out, will at least point the way to a new and prolific field of investigation.

The second part of the book constitutes a record of the very numerous original observations of the author upon the habits, protective contrivances, and deceptive appearances of insects and spiders, very copiously illustrated by his own excellent drawings. Very striking is the mass of evidence showing how creatures of all kinds adopt, when at rest, the particular attitude best serving to conceal them. A spider, which introduces into its web a horizontal bar, rests in a horizontal position so that its body appears to form part of the bar; one whose web contains a vertical bar rests in a vertical position exactly in line with the vertical bar; and one which spins two bars at right angles places its eight legs in four pairs in line with the four arms of the cross. Stick-insects of abnormally slender build stretch their long legs straight forward, increasing still further the stick-like appearance and a weevil with pale blotches upon its back, which conceal it as it rests upon a mottled grey trunk, invariably rolls over when it falls to the ground and so presents a uniformly dark exterior, just as a bright-coloured butterfly, when pursued, puzzles and eludes its pursuer by the sudden disappearance of the bright hue, when it alights and immediately hides its brilliant hind wings beneath its dull-coloured anterior pair.

The account of the web- and shelter-building devices of spiders is especially full and interesting, but insects of every kind also contribute their share of instances to a fascinating story. The conclusion of the matter in Major Hingston's view may be stated as the universality of protective resemblance.

> "Through all this riot of animal variety one great principle impresses us at every turn, the ever-present law of harmonization. It is exemplified all through the forest from the ground carpet to the covering canopy and in every branch of the animal kingdom."

In an Appendix at the end of the volume 27 species of spiders referred to earlier are named and described.

Hunting Insects in the South Seas. By EVELYN CHEESMAN, F.E.S., F.Z.S. 243 pp. (Philip Allan & Co. 10*s.* 6*d.* net.)

UNDER this title Miss Cheesman gives us a further account of her wanderings in far away Melanesian islands and especially in the cannibal New Hebrides.

The chief, but by no means the only, subjects of her lively and humorous descriptions are the insects she encountered there. Who has not heard some traveller lately returned from tropical regions recount in terms of horror his experiences of the teeming insect life. To this author the insect life is the attraction which impels her to face the many discomforts and by no means negligible dangers of these wild regions—the concluding chapters relate in vivid language events so exciting that the book may be described as a true tale of adventures great and small. In her Foreword she writes of her experiences: " The insects are the serious part of existence; all the rest is just a joke—a bad joke at times, but not worth worrying about; " and later on: " insects are a fit accompaniment to all our occupations indoors or out; and you can no more prevent their exploiting all your resources than you can prevent their exploiting the forest with its bounty." It is evident that much depends upon meeting them in the proper spirit. What that spirit is can be well learnt from this book. There are separate chapters on various groups of insects, Potter Wasps, Friendly Butterflies, Praying Mantises and Stick Insects, Fireflies, Bees and other Hymenoptera, etc., and nearly all are enlivened by episodes in which individual insects figure in an attractive light. For example: " The most amusing sight I ever saw was two Potter Wasps each with a long caterpillar trying to put them into the same urn. Each was so certain that the cell was hers, and it led to a bumping match of unusual vigour; the wasps facing one another in mid-air, holding their caterpillars dangling in front, like school-children having a bolster fight. I half expected to see one assault the other with her living bolster. . . . It was the solemnity of their long faces which put the finishing touch to the burlesque. If they had smiled it would not have been half so comic, but as it was I laughed till I cried."

If many of the insects described seem to possess endearing qualities almost human in character, the natives, at least those of the New Hebrides, although they are studied with the same humorous understanding as is devoted to the smaller but more attractive creatures, impressed the author as " scarcely human." They suffer from at least one defect from which the insects as a class are conspicuously free, neglect of personal cleanliness. But whether she is dealing with insects, men or other animals, Miss Cheesman invariably writes in such a light, engaging style that her book will delight both those who are primarily interested in its principal subjects and those who are not.

In the interest of those who regard binomial nomenclature with dismay, scientific names are usually omitted from the text, but those who desire precise and accurate information will find them collected together in an Appendix. There are some excellent illustrations and, that nothing may be wanting for completeness, an Index.

The Biology of Spiders, with especial Reference to the Danish Fauna. By E. NIELSEN. Vol. I, pp. 248, with 32 plates and 10 text-figs.; Vol. II, pp. 723, with 5 coloured plates and 462 text-figs. (Copenhagen: Levin and Munksgaard. 1932. 30*s.*)

DR. NIELSEN has adopted a method of presentation for his work on the Biology of Spiders which, while it has something to recommend it, is apt to be confusing to the reader. Volume II may be properly regarded as the complete work in Danish, with Volume I as the abridged edition in English. The English edition, however, is incomplete without Volume II, where the bibliography, the lists of Danish Spiders, the lists of wasps parasitic on Spiders' cocoons and the majority of the photographs are published. On the other hand, Volume I has thirty-two original plates not represented in the Danish volume.

In the English edition alone the subject has been treated very fully and with a wealth of example, but necessarily a lot of useful information appears only in Volume II. In particular, chapter 1 of that volume giving a detailed account of the structure is of value in a work that reveals a close study of the functions of the various organs and the general behaviour of the Spiders.

All the other chapters of Volume II are fairly represented in Volume I. A whole chapter (chapter 3 of Vol. I and chapter 5 of Vol. II) is devoted to the subject of parasites of spiders and will be welcome not only to the arachnologist but also to the entomologist.

The whole is well illustrated with Dr. Nielsen's excellent photographs, and students will find in it both a summary of work published up to date and an account of many interesting original observations.

Zo. By E. SUNAMOTO. Vol. I. Pp. 1151, with 19 plates. (Osaka: F. Sunamoto Shoten. 1932. 30 *yen*.)

NEEDLESS to say, much has been written on the Elephant ("Zo" in Japanese), an animal which is familiar to us from our childhood, and it is perhaps one of the animals best known to the non-specialist. The author of this monumental work has been good enough to present a copy of it to the Natural History Museum. It is a remarkable achievement on the part of a young man—for he appears to be still under thirty years of age—and still more so if it be remembered that he has never been out of Japan and has compiled his information from works in a variety of languages—English, French, German, Italian, Spanish, Dutch, Russian, Chinese, Latin, and Greek; evidence of remarkable linguistic gifts.

The book is full of interesting information. In the ancient Egyptian tombs carved ivory has rarely been found, but in China at about the same date it was in use though considered a great luxury, and a certain Emperor is said to have had his chopsticks made of it. The order of the White Elephant is the highest of the Siamese decorations, and a similar order was established in Denmark by Christian I. The author gives the history of the famous African elephant "Jumbo," which lived for seventeen years in captivity—for a time at the Zoological Gardens in London—and died as the result of a collision with a train in Ontario. The nineteen chapters are devoted to various aspects of the subject such as physiology, natural history, mythology, and others too numerous to mention.

It is a grave handicap to the Western reader that the book is written entirely in Japanese, but the bibliography to appear in the second volume, promised later, will be very useful.

RECENT IMPORTANT ALTERATIONS AND ACQUISITIONS.

An extensive exhibition of the Game Animals of the Empire has been opened in the new Whale Gallery, and a special illustrated guide-book in connexion with it, compiled by Capt. J. Guy Dollman, is on sale at the price of sixpence.

Two cases, illustrating the Musk Rat Menace, have been placed in the Central Hall near the Main Entrance.

Case illustrating the Musk Rat Menace.

The first of a projected series of scenes representing the fish-fauna of successive geological epochs has been placed on temporary exhibition near the entrance to the Geological Gallery.

Department of Zoology.

A pair of Elephant tusks, which have been exhibited on loan in the Museum since 1930; presented by Sir William Gowers, G.C.M.G.

A collection of 60 mammals and 590 birds obtained by the Vernay-Lang Expedition in the Kalahari Desert, and the collection of 184 mammals, 29 reptiles, 34 fishes, and 500 butterflies obtained by Capt. Holloway, who accompanied the donor on an expedition to the Malay Peninsula; presented by Mr. A. S. Vernay. The latter collection includes a specimen of the rare *Rhinoceros sondaicus*, which was shot by Mr. Vernay.

A collection of over 70 Big Game trophies from India and Africa; presented by Sir Richard Dane, K.C.I.E.

A collection of some mammals, 102 reptiles and amphibians, 900 fishes (including about 30 new species), and many molluscs and other invertebrates, obtained by Dr. E. B. Worthington in the course of the Cambridge University Expedition to the East African lakes.

Collections of considerable value, including a fine specimen of the St. Vincent parrot and a second specimen of the very rare eel, Anguillichthys, of which the first specimen to reach the Museum was caught during last year's cruise to the West Indies; obtained by Officers of the Atlantic Fleet during the cruise to the West Indies in 1932.

A mounted specimen of the African Lion; presented by Mr. Gilbert Blaine.

The first instalment of a collection of birds from Portuguese East Africa, collected by Mr. Jack Vincent; presented by Rear Admiral H. Lynes, C.B.

A champion Borzoi dog (Champion Nevarc Bubbles); presented by Mr. Arthur Craven.

A collection of over 1000 birds from Yunnan, formed by the late Mr. G. Forrest; presented by the Godman Exploration Fund.

A collection of birds from Iraq and Persia; presented by Dr. P. A. Buxton.

Photographs of North American big game; presented by Mr. Harper Cory.

A mounted example of a rare marsupial mouse (*Caenolestes obscurus*), from Mount Pichincha, Quito, Ecuador; purchased.

An aard-vark (*Orycteropus afer*), from South Africa; purchased.

Department of Entomology.

The collection of nearly 114,000 British and 4,200 Exotic Coleoptera formed by the late Dr. David Sharp, F.R.S.; purchased.

Department of Geology.

A small series of South African fossil reptiles, including type and figured specimens; presented by Dr. Robert Broom.

An important collection of fossil reptiles (Nothosaurs) from the Alpine Trias of Besano; purchased.

Teeth of an extinct shark, *Edestus*, from the Devonian rocks of Rhenish Prussia; purchased.

Department of Mineralogy.

A collection, comprising a large series of rock specimens, and meteoric iron (a mass of 25 lb. and several smaller pieces), a large quantity of unique silica-glass, and a small meteoric iron from Naifa, obtained by Mr. H. St. John Philby during a journey across the Arabian desert; presented by His Majesty the King of the Hejaz and Nejd.

A further instalment, comprising 772 specimens from 62 localities, of Swiss minerals, gem crystals of lapis-lazuli, red spinel, and yellow orthoclase, the new minerals vauxite, metavauxite, and paravauxite from Bolivia, and cordierite, yttrotitanite, and yttrofluorite from Norway; presented by Mr. F. N. Ashcroft.

A piece from the 15-ton mass of meteoric iron discovered in 1930 near Mbosi in Tanganyika Territory; presented by the Director of the Geological Survey of Tanganyika Territory.

Well-crystallized zeolites from Melbourne, Victoria, minerals from Broken Hill, New South Wales, and various minerals and rocks from Australia, Canada, and West Africa; presented by Sir Albert E. Kitson, C.M.G., C.B.E.

A large crystal of linnaeite from the Mufulira copper mine in Northern Rhodesia; presented by the Directors of the Mining Company.

A piece of a meteoric stone from Kirkuk, Iraq; presented by Capt. R. S. Cook.

Specimens of crystallized minerals from the diamond mines at Kimberley, South Africa; presented by the Viscountess Milner.

A series of Western Australian minerals; presented by Dr. Edward S. Simpson.

Polished slabs of orbicular granite and other rocks from Finland; presented by the Geological Survey of Finland, through the Director, Prof. J. J. Sederholm.

Three crystals of diamond, weighing 10·17 carats, showing faces of the cube, dedacahedron, and octahedron, from the Belgian Congo; purchased.

A large series of rocks collected by the donor to illustrate the geology and mineralization of several mines in the copper belt of Northern Rhodesia and Katanga; presented by Prof. G. Vibert Douglas, M.C.

Samples of volcanic dust, which fell after the eruption in the Andes on April 11–12; presented by the Times Publishing Company and by Messrs. H. W. Nelson, Ltd.

Wulfenite from Slovenia; presented by Mr. H. S. Gordon.

Legrandite, a new zinc arsenate, from Mexico; presented by Dr. J. Drugman.

One half of a unique specimen of the rare mineral crednerite from the Mendip Hills; presented by Mr. H. E. Balch.

A specimen of pitchblende (radium ore) from the recently discovered occurrence on the Great Bear Lake, Canada; by exchange.

Sambornite and gillespite, new barium silicates, from California; purchased.

A series of crystallized specimens of cerussite, anglesite, chessylite, smithsonite, and mimetite, from the Tsumeb copper mine (now closed down) in South-West Africa; purchased.

Crystals of phenakite from South-West Africa; purchased.

Department of Botany.

A further collection of plants from Nepal; loaned by His Majesty the King. The plants were presented to His Majesty by Major-General His Highness Maharaja Sir Bhim Shumshere Jung Bahadur, K.C.S.I., K.C.V.O., Prime Minister and Marshal of Nepal.

A series of 320 specimens of plants collected by Mr. H. St. John Philby during a journey across the Arabian desert; presented by His Majesty the King of the Hejaz and Najd.

A large collection of plants from the Upper Irrawaddy and the Burma-Tibet frontier; presented by Capt. F. Kingdon-Ward.

The British Herbarium of the late Dr. John Thomas Irwin Boswell (1822–1888); presented by Mr. Frederick J. Hanbury.

A collection of 254 flowering plants and ferns; obtained during the Vernay-Lang Kalahari Expedition in 1930; presented by Mr. A. S. Vernay.

OBITUARY.

GEORGE ALEXANDER SMITH.

Mr. G. A. Smith entered the service of the Trustees as a Boy Attendant in 1896. At first he worked with the late Professor Jeffrey Bell, and one of his earliest tasks must have been to assist in removing the collection of Crustacea from the Old Spirit Building to what was then the "Challenger" Room in the basement of the East Wing and is now the Rock Room of the Mineral Department. When I first visited the Museum in 1898 this removal was still incomplete and Smith was busily engaged on it. At that time Professor Bell had under his charge a very varied assemblage of animal groups which are now cared for by some half-dozen Assistant Keepers, and it was while working with him that Smith acquired the interest in Echinoderma which he retained till the end of his life. In later years when that group of animals, together with the Annelids, was allocated to a single Assistant Keeper, who found his hands sufficiently full in the study of Polychaeta, Smith's knowledge of the Echinoderma was of great assistance, and many overseas visitors have paid warm tribute to the help he gave them. Perhaps Smith's experiences in the War, when he served in the Royal Army Medical Corps, did a good deal towards developing the organizing capacity and power of taking responsibility which were afterwards shown when as Higher Grade Clerk he was put in charge of the Subordinate Staff in the New Spirit Building. In this position he was responsible for the ordering and distribution of bottles, spirit, and laboratory supplies, and also for a great amount of detail, principally in connexion with the supply of collectors' gear and the equipment of expeditions. Smith was greatly interested in, and acquired a considerable experience of, laboratory methods and equipment, and his knowledge was always at the disposal of the staff and visitors. He was very largely responsible for building up the organization of the New Spirit Building, which still runs very smoothly, thanks to his preliminary work.

In the Museum we heard little of Smith's activities outside, but we knew at any rate that his work for the Shaftesbury Association gave evidence of a public spirit that was perhaps commoner in the last generation than it promises to be in the next. My long acquaintance with Smith leaves without any reserves my testimony to a sterling character and an attractive personality.

W. T. C.

In the course of an acquaintance with G. A. Smith extending over twenty-one years and of a close official association of seven years, I acquired a very warm personal regard for him. His sincerity, friendliness, high sense of steadfast duty, and above all his understanding of the troubles and difficulties of others were the outstanding features of a very lovable character. Experience and suffering enriched and did not warp his nature. G. C. R.

From the time I joined the staff of the Museum, nearly ten years ago, G. A. Smith was my official assistant, and I shall never forget with what patience and kindly tact he initiated me into the mysteries of Museum routine. As time went on, my liking for him and my admiration for his qualities had an equal growth. He was loyal to his friends and to the institution which he served; he was unfailingly generous and sympathetic with those who worked under him, and was their confidant in all their troubles. He had a robust and genial English sense of humour which made him a delightful companion. He was shrewd in his judgments and courageous in his opinions, but what endeared him most to me was his simple-hearted charity. C. C. A. M.

STAFF NEWS.

Mr. James Ladbrook, Higher Grade Clerk in the Department of Botany, retires on 30 July, 1932, after the completion of over forty-seven years in the service of the Trustees. He entered the Museum as a Boy Attendant on 19 January, 1885, and his papers were the last to be signed by the Principal Librarian at Bloomsbury. Mr. Ladbrook for many years has done the preliminary sorting of the botanical collections as they arrived, and his skill in this work will be missed in the Department as much as will his cheery comradeship.

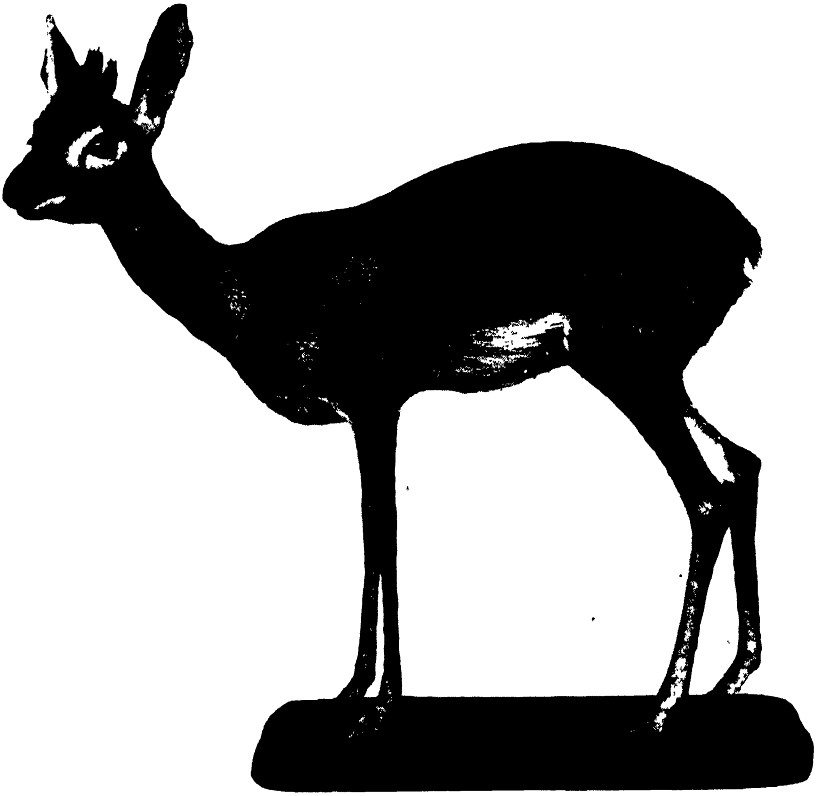
Natural History Magazine

No. 24 OCTOBER, 1932 *Vol. III*

ANGOLAN DIK-DIK.

By J. Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

The specimen here illustrated is a female of the Angolan race of the Damara dik-dik, *Rhynchotragus damarensis.* This race was originally described in 1913 by Dr. R. E. Drake-Brockman and named by him *Rhynchotragus damarensis variani* after Mr. H. F. Varian, the well-known sportsman, who collected the type specimen at Lobito in Angola. This dik-dik is very like the Damaraland form, but differs in being brighter in colour, the buff colour of the flanks extending down on to the abdomen



Angolan Dik-dik.

and chest instead of passing directly into the white of the underparts.

The Damaraland and Angolan dik-diks are relatively large members of the genus *Rhynchotragus*, standing about 15 inches at the shoulder; Cavendish's dik-dik (*Rhynchotragus kirki cavendishi*), from East Africa, is the only other *Rhynchotragus* which equals *damarensis* in this dimension. The record horn length is 4 inches; as with other members of the sub-family, horns are only developed in the male sex.

The dik-diks, which are classified as representing two genera, *Madoqua* and *Rhynchotragus*, are typical East African animals, and the occurrence of this single species in South-west Africa can only be regarded as a striking example of discontinuous distribution. The dik-diks belonging to the genus *Madoqua* are entirely confined to Eastern Africa, their chief home being in Somaliland and Abyssinia. The various species of *Rhynchotragus*, with the exception of *damarensis*, are also inhabitants of East Africa, being found only in Somaliland, Abyssinia, and the Sudan southwards to the northern part of Tanganyika Territory. No dik-dik has ever been recorded from Central or South-central Africa; thus it is not a little surprising to find one of these small antelopes occurring in the south-western part of the Continent.

The Damara and Angolan dik-diks do not exhibit the great elongation of the nose so characteristic of one of the East African groups (*Rhynchotragus guentheri*). In these latter animals the nasal bones are greatly reduced in size and the nose is enlarged and forms an almost tapir-like proboscis. In *Rhynchotragus damarensis* the nose, although longer than in the typical dik-diks of the genus *Madoqua*, is relatively short, not exceeding in length and development that found in Kirk's dik-dik and allied races.

The genus *Madoqua* is distinguished by the last lower tooth having only two lobes, whereas in *Rhynchotragus* this tooth is tri-lobed. Further, the nasals are short and the nose long or trunk-like in the latter genus, while in *Madoqua* the nasal bones are longer and the nose is only normally developed. The horns in both types of dik-diks are short and nearly straight, with strongly developed basal ridges. As a general rule the females are rather larger than the males, and in both sexes a tuft of long hair grows on the crown of the head. This tuft frequently conceals the horns of the bucks to such an extent that the sportsman may be in difficulties in deciding to which sex an animal belongs.

Of recent years the sub-family Madoquinae has been regarded as containing not only the dik-diks, but also the Beira (*Dorcotragus melanotis*). The arrangement cannot be considered as very satisfactory, and such a classification can only be looked upon as a convenient method of temporarily disposing of an animal whose affinities are almost as little known as are those of the Dibatag (*Ammodorcas clarkei*). Formerly the Beira was placed in the sub-family Antilopinae and was regarded as an aberrant member of the Gazelle group. It has been shown however, by Pocock, that the foot-glands are very much the same as those found in the dik-diks, and on this account the Beira is now considered by some authorities to be a member of the sub-family Madoquinae.

COLLECTING INSECTS IN CENTRAL EUROPE.

By Daphne Aubertin, M.Sc., Assistant Keeper, Department of Entomology, and Ethelwynn Trewavas, B.Sc., Unofficial Scientific Worker.

It is a surprising fact that the insects of Samoa, Tropical Africa, and South America are better represented in the collections of the British Museum than are those of Central Europe, and it was with a view to remedying this state of affairs that we set out for the Tatra Mountains.

This group of mountains, the highest in the Carpathians, occupies an area about twenty miles in length and fifteen in depth; it lies eighty miles south of Krakow, and the present boundary between Poland and Czechoslovakia runs for some distance along the jagged ridges. The central massif, bearing the highest peak (8734 feet), is granite, while the foothills to the north, east, and west are of limestone; the flora of the limestone areas is considerably richer than that of the granite, but, apart from specific associations of plant and insects, it is highly improbable that any connexion between the composition of the insect population and the variation of the underlying geological formation will become apparent.

We left Vienna on the 26th of May, travelling by steamer down an opaque grey Danube—we were told that it is never blue —to Bratislava, on the boundary between Austria and Czechoslovakia. Here, somewhat embarrassed by two large and intractable collecting cases, the sudden change to a monetary system, of which the unit looks like a two-shilling piece and is worth about 1½*d*., and a markedly incomplete knowledge of any of the current languages, we transferred ourselves to a train which took us up the valley of the river Váh to Poprad. From here one travels to a level of 3000 feet by an electric railway, which then runs along the foot of the mountain range for a distance of fifteen or twenty miles, connecting up the numerous tourist centres and sanatoria. We made our first headquarters at Tatransky Domov, a pension owned by Hungarians, who were charming to us and gave us a great deal of assistance. Dr. Reichart, jun., was particularly kind in obtaining scientific books from the Tatra Verein, and in putting his local knowledge, obtained by much ski-ing and mountaineering, at our disposal.

Photograph by E. Trewavas.

FIG. 1.—THE HIGH TATRA, CARPATHIAN MOUNTAINS.

We decided to collect insects of all groups, with the exception of Lepidoptera, concentrating on taking long series, on getting them home in perfect condition, and on making as many ecological notes as possible. A little experience showed us that ecological work was incompatible with mass collecting; so we contented ourselves with making notes of the plant associations of each locality where collections were made, and the botanist of the party worked until the small hours, after the routine work was done, naming plants with an inadequate Flora, and then pressing them. In order to get our collection back to England in good condition, it was imperative to pack each day's catch on the same evening. Flies and large beetles were pinned; bugs and small beetles were packed in cardboard boxes (3 inches by 2 inches) containing finely graded sawdust; aphides, collembola, larvae, and other soft-bodied creatures were preserved in tubes of alcohol, and all other groups (Hymenoptera, etc.) were placed individually in paper triangles and stored in wooden boxes. By this method about 8000 specimens were brought back without damage.

By the end of May the snow has melted at the height of 3000 feet, but spring is still far behind, and we spent the first week under lowering clouds, although the sun shone persistently on Poprad about ten miles away across the valley. Our plan was to collect in as many types of habitat as possible and at various heights; insects, however, were so scarce at this time that our activities were confined almost exclusively to the banks of streams, while laborious walks to a height of five or six thousand feet led us into clouds, snowfields, and frozen lakes, where it was a palpable waste of time to try to collect anything, and we were fully occupied cither in progressing delicately over soft snow four feet deep, or in avoiding a swift and involuntary descent to a warmer climate over snow and granite scree.

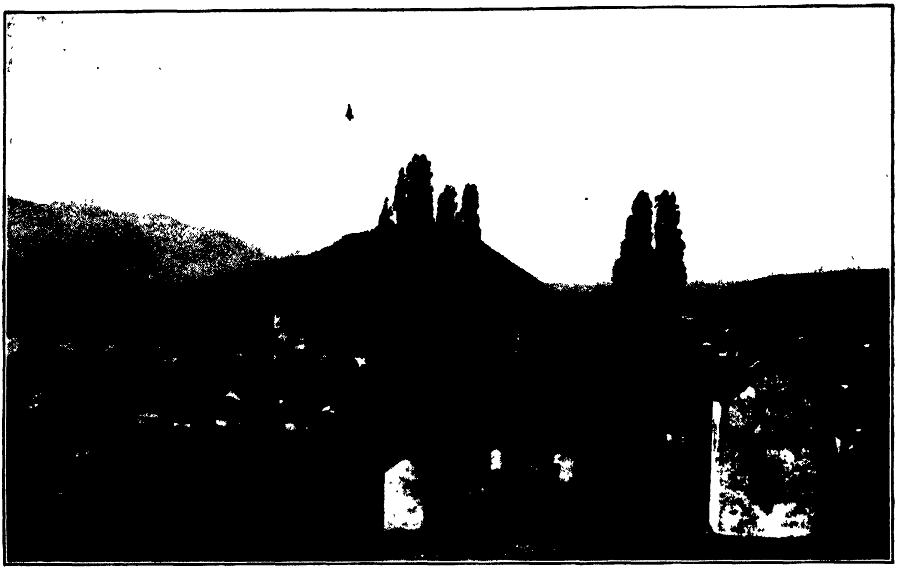
Photograph by A. Aubertin.

FIG. 2.—TYPICAL COLLECTING GROUND IN CZECHOSLOVAKIA.

(Miss Trewavas with net.)

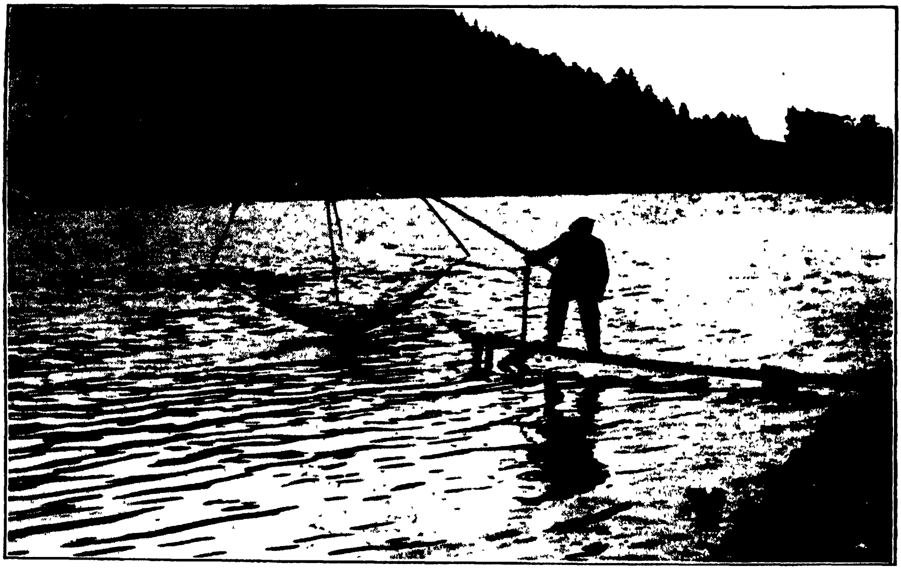
The scarcity of insects, due mainly to lack of sun, led us to cover the ground with extreme thoroughness, and we may possibly have obtained a few species which are considered rare merely because they appear very early and are therefore not taken in numbers. Ants were everywhere, but, unless we found them busy with colonies of aphides, we left them alone; there were also innumerable cockchafers hanging thickly on the few deciduous trees, distractingly restless insects which were always stretching or folding their wings with a provocative rustle, zooming around on short trial flights, or dropping to the ground in a series of dull thuds. It was apparently " a cockchafer year."

After a week of collecting anything we could find and waiting for the spring at Tatransky Domov, we packed rucksacks with collecting gear for four or five days and fled to a more genial climate at a height of 1000 feet above the level of the sea. Ružomberoc is a small market town, lying among limestone hills



Photograph by E. Trewavas.

Fig. 3.—Calvary Hill, Ružomberoc, Czechoslovakia.



Photograph by E. Trewavas.

Fig. 4.—Fisherman on the River Váh, Ružomberoc, Czechoslovakia.

in the valley of the river Váh. It is not frequented by tourists, but we found adequate accommodation at a small commercial hotel, where the beds were clean, the food passable, and German was understood by at least some of the staff. Here spring was rampant and we made large collections, but attempts to obtain samples of the insect fauna from the hill-tops were not very successful; it was apparently only necessary for us to climb up to a really exposed limestone crag, for the rain to come down in torrents.

We were fortunate in being in Ružomberoc on the Sunday of the feast of the Sacred Heart. Early in the morning the country people began streaming in from the villages in processions, each village having its own peculiar costume, so that we had a perfect and unaffected display of all the women's best embroideries, their stiffest starchings, and gayest ribbons. The men wore white shirts with coloured embroidery at the neck and with sleeves either wide and open or gathered into an embroidered cuff. Their trousers were of cream blanket-cloth, with coloured braid and embroidery.

Photograph by D. Aubertin.

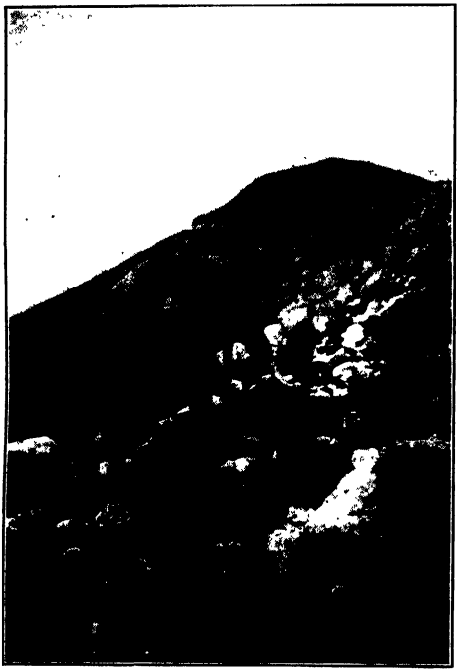
FIG. 5.—VELICKÝ RIVER NEAR ITS SOURCE, TATRA MOUNTAINS.

When we returned to Tatransky Domov conditions were very much pleasanter and, although there were occasional cold winds, and one or two very wet days, we were now able to use nets, and the beating tray, which had previously been the best method of attack, was relegated to the background.

During the next ten days collections were made in all the main valleys on the south side of the mountains up to a height of 5000 feet, but further exploration into the Krummholz zone was as yet of very little use. The valleys are widely separated by high mountain ridges, but are much the same in general aspect, each with a tumultuous stream pouring down from one of the lakes.

The lower slopes are clothed with dense forests of *Picea*, and above this is a zone of Krummholz, or dwarf pine, succeeded by short grass and bare rock. There are no true snow mountains in the Tatra, and no glaciers, although moraines and hanging valleys mark the position of glaciers of the ice age.

The fauna of this region contains some interesting animals. Apart from insects, our immediate concern, we frequently saw marmots at a height of 6000 feet, whistling among the most desolate surroundings of rock and snow, while occasional chamois bounded about on the lower slopes, stamping and blowing through their noses at us. Bears and wild boar are now rare, and a single bison, which had been at large in a nature-reserve, was recently removed to the Prague Zoo.

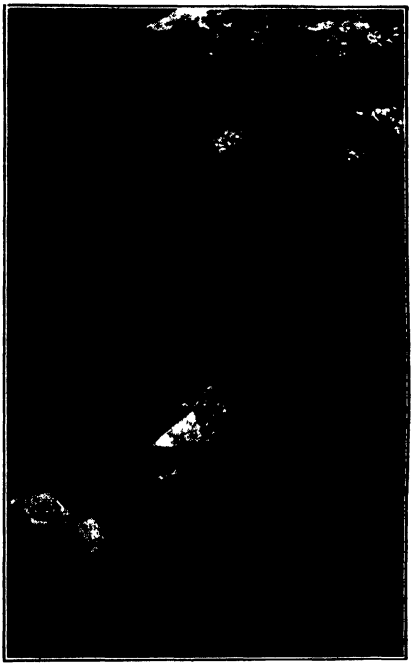


Photograph by D. Aubertin.

FIG. 6.—BEETLE-HUNTING, LILIOWE PASS, POLAND.

We decided to make our second headquarters at Zakopane, a sprawling Polish village which is gaining some prominence as a tourist and winter sports centre; it lies on the north side of the mountains, about fifteen miles, as the crow flies, from Tatransky Domov, but may only be reached, when encumbered with luggage, by a riotous motor-omnibus ride over thirty miles of bad road.

We settled down in a pension at Bystre, at the foot of the mountains and about a mile from Zakopane, and again explored the various valleys, which were rather more accessible on this side of the mountains than on the other. We paid an early visit to the Tatra Museum, which specializes in the culture of the Tatra highlanders or " Gorâlen." The Director, Dr. Zborowski, although an ethnologist himself, was extremely kind and obtained much information about the best collecting grounds and the haunts of endemic varieties of beetles from a professor in the University of Krakow. At his instigation we decided to spend a few days at the Tatra Verein Hostel in the Hala Gąsienicowa. This is a comfortable, well-equipped Rest House for tourists and mountaineers, built in an amphitheatre of mountains and lakes, at a height of 5000 feet. From here we went up to Liliowe Pass (6000 feet), where there was little to be found except daddy-long-legs, and beetles under stones, but we were buoyed up by the hope that what little there was must at this height be something rich and rare ! While staying at the hostel we made a determined attack on the insect fauna of the Krummholz. A more malevolent shrub can hardly be imagined. It sends out horizontal branches immediately above the ground, strong, twisty, exceptionally elastic branches, which smack the intruder in the face and form an impenetrable barrier. One enters this thicket by a cow-track, but, where the cow in her wisdom backs out again, "man, proud man" attempts to go on; but not through. One may stand on the lower branches, or crawl under them, but to make a way by pushing them aside is excessively exhausting. In one valley, where the prevailing wind was strong enough to determine the direction of the longest branches, penetration in that direction was comparatively easy, but against it, impossible.

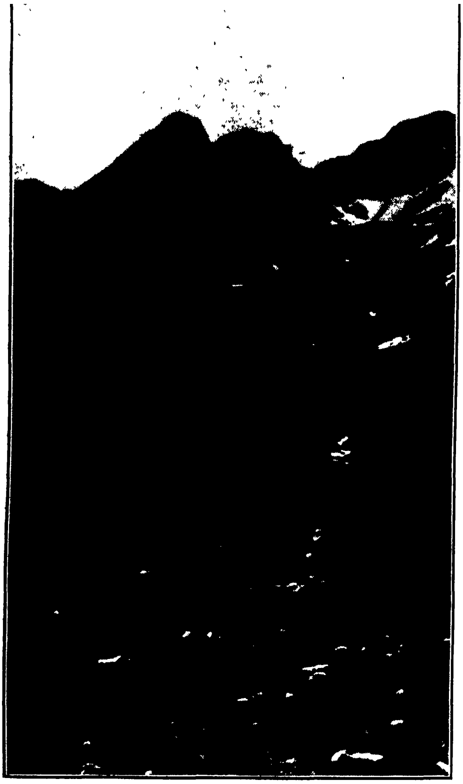


Photograph by D. Aubertin.

FIG. 7.—"KRUMMHOLZ" (PINE) AT AN ALTITUDE OF 5200 FEET, TATRA MOUNTAINS.
(Miss Trewavas in foreground.)

From Gąsienicowa we took a guide over the granite ridge of Zawrat, into the valley of the Five Lakes, and then over a second ridge to Lake Morskie Oko, spending a night and a day at another hostel before returning to Zakopane. Water-beetles and pond-skaters were caught in the ice-cold water of the mountain lakes, which add so much charm to this part of the world, and our guide, becoming enthusiastic, turned over giant boulders for us to collect the scurrying fauna thus revealed. This included innumerable centipedes, since Andreaš knew no German and was so pleased with his catch that we felt we could not, without due explanation of the significance of six legs, reject any of it.

The language problem, however, was never a matter of any serious difficulty. The Czech side of the frontier was in Hungary before the recent rearrangement of boundaries, and, although Czech is now the official language, Hungarian is widely spoken, and, luckily for us, the inhabitants have found that a knowledge of German is to their economic advantage. In Poland the alternative language is French, and one occasionally finds peasants who can speak American!

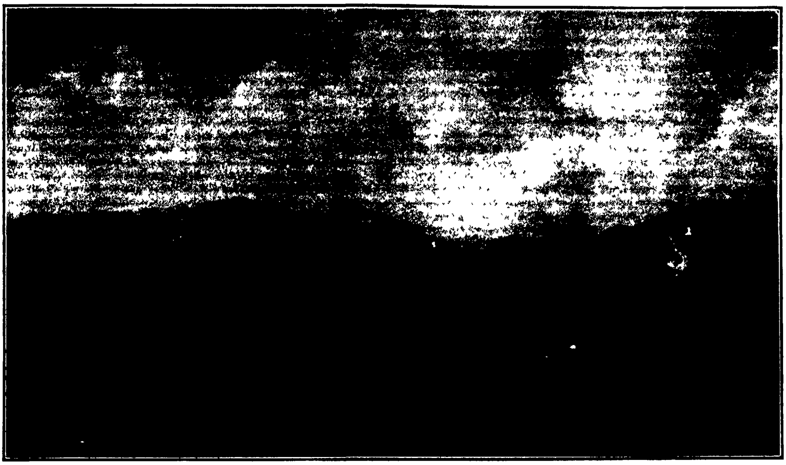


Photograph by D. Aubertin.

FIG. 8.—GREEN LAKE, POLISH TATRA, NEAR LILIOWE PASS.

Before leaving the Tatra, we spent three or four days at Tatranská Kotlina, a small Czech health resort at the foot of a limestone range, the Bela Kalk Alpen. The scenery here was magnificent. We made good collections, and spent one morning visiting a limestone cave, but failed to obtain specimens of a blind Collembolid (*Lipura*), reputed to live there. An expedition was also made to Dobsina, where there is a famous ice-cave which we were anxious to see. From the warm sunshine on the side of a wooded hill we entered the ice-cold cavern. A block of ice, about 100 feet thick, forms its floor. Glistening ice-crystals line the roof and walls, and turn the electric-light wires into fantastic festoons of jewels. There are ice stalactites, which in one place take the form of a thin fringed curtain of translucent green. Only on the outer wall, towards the mountain-side, was the bare rock visible, and between it and the ice-block was a space of which advantage had been taken to build a wooden gallery and steps down into the cave. Apparently no insects had found it worth while to acclimatize themselves to this cold darkness, and we made our collection that day on the hillside and in a meadow by the river below.

For a pleasant holiday, rather off the beaten track, among kindly people and in lovely country, the High Tatra Mountains



Photograph by D. Aubertin.

FIG. 9.—VIEW FROM LILIOWE PASS, BETWEEN POLAND AND CZECHOSLOVAKIA.

can emphatically be recommended; and for entomologists there are still many insects left !

THE NEW FOREST PONY.

By MAUD MONTAGU BRUCE.

THE New Forest Ponies, so well known to motorists and the more humble pedestrians, are owned by a number of different persons, each owner branding the foals with his own mark. Half-a-crown a year has to be paid by the owner for each foal allowed to roam wild in the Forest. They frequent the greens near villages rather than the more outlying parts of the Forest, and the same pony will be found regularly at the same spot. It is said that, if one were taken many miles from its ordinary haunt, it would find its way back before many hours had elapsed.

The breed was formerly used in connexion with coal-mining, but as pit-ponies they are now less in demand than formerly; consequently the price fetched for these ponies is much lower than it was, and a good pony can now be bought for as low a figure as thirty shillings.

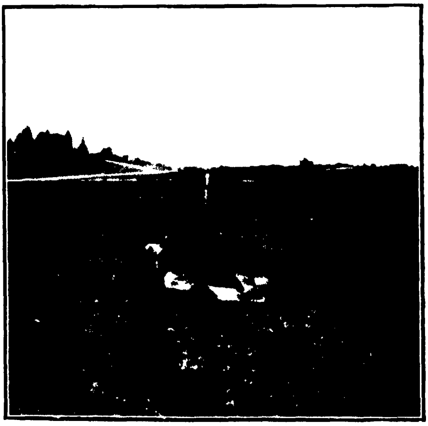
The best known breeds of ponies in this country are the Welsh pony, Highland pony, New Forest pony, Dartmoor pony, Exmoor pony, and Shetland pony. The New Forest pony stands from 12 hands to 13 hands 2 inches in height; if taken special care of and removed from the New Forest district to

Photograph by M. M. Bruce.

NEW FOREST PONY.

Photograph by M. M. Bruce.

MARE AND FOAL.



Photograph by M. M. Bruce.

FOAL.

more fertile surroundings when still quite young, they will grow to be nearly as large as polo ponies, which measure as much as 14 hands 2 inches. In colour they are very variable, some being dun-coloured and others brown, while other horses are flea-bitten greys, the latter showing strong traces of Arab blood. Piebalds are comparatively rare. The famous horse " Marske," the sire of " Eclipse," was kept for a time in the New Forest and doubtless did much to improve this breed of ponies. After a brief spell of regeneration the breed again degenerated, but was at a later date improved by Queen Victoria and the Prince Consort in introducing Arab blood among the New Forest ponies.

THE INTRODUCTION AND EXTERMINATION OF ROE DEER IN IRELAND.

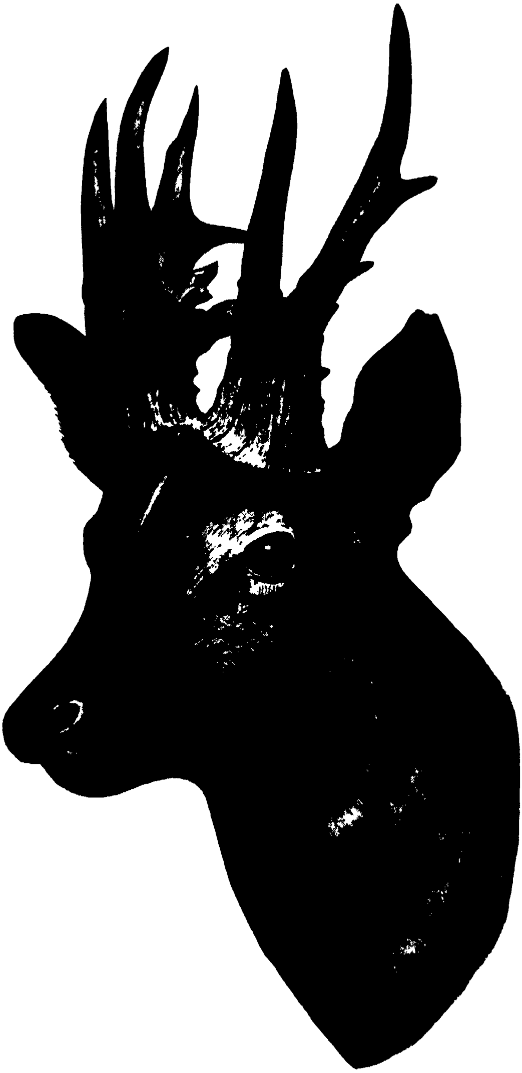
By Edgar N. Barclay.

The transfer of wild animals to a new environment is an experiment, the results of which are at all times uncertain, and the liberation of non-indigenous animals in unenclosed country is liable to disturb the balance of nature and to have far-reaching and unforeseen results.

Where the essential control of numbers, due to the natural increase of the introduced species, is difficult to maintain, danger is always to be apprehended, as in the case of the rabbit in Australia, the red deer in New Zealand, the musk rat in Europe, and the grey squirrel in England. All experiments of this nature have, however, afforded some points of interest to the zoologist, and the introduction of roe deer to Ireland is no exception in this respect, though it does not appear that the full details of their introduction and subsequent extermination have hitherto been recorded.

During Pleistocene times roe deer were widely distributed in England, Scotland, and Wales, but curiously enough they were not present in Ireland, although the nature of that country seems so admirably adapted to their requirements. Some writers in the past have referred to their former existence, but no authentic Irish remains have ever been found, and they cannot, therefore, be regarded as indigenous to that country.

The only known instance of their introduction to unenclosed country in Ireland was carried out at Lissadell, County Sligo, where the late Sir Henry Gore-Booth turned down a limited number of roe deer between 1870 and 1880. Lissadell is on a limestone formation, and the richness of the pasture and the variety of the browsing, together with the mild and damp



From a drawing by the Author.

Fig. 1.—The Most Massive Roe Deer Head.

nature of the climate, proved such an ideal habitat for these deer that they rapidly attained to a quite remarkable standard of excellence. The original stock was obtained from Scotland, but no roe deer in that country ever produced horns equal to those grown by the Lissadell animals, some of which are as massive as the heaviest heads from Central Europe and Southern Sweden. The late Mr. J. G. Millais figured several of these remarkable heads in "British Deer and their Horns" (1897), and from this source I take the measurements of the following four examples :—

1. A twelve-point head (Fig. 1).
   Length of right horn 9½ inches. Length of left horn 9¾ inches.
   Circumference of right coronet 8⅛ inches.
2. A head of normal type.
   Length of right horn 11 inches. Length of left horn 10½ inches.
   Brow points 4⅞ inches. Span 6⅞ inches.
3. A cast horn.
   Length 9 inches. Circumference of coronet 9 inches.
4. A cast horn.
   Circumference of coronet 9¼ inches.

No. 1 is undoubtedly the heaviest British roe deer head known, but the mere measurements give little indication of its great massiveness. The horn is rough, all the points are well developed, and they retain their thickness right to the tips. This notable head was shown at the Exhibition of British Deer Heads held in London in 1913, and in the section devoted to roe deer it was outstanding. The animal itself was found dead, and was believed to have been killed while fighting.

I am indebted to the present owner of Lissadell, Sir Josslyn Gore-Booth, for kindly furnishing me with information in order to complete the history of the Sligo roe deer. It is an unfortunate fact that roe deer are the enemies of the keen horticulturist and arboriculturist owing to the damage that they do, and at Lissadell they did so much mischief that they were finally got rid of about the year 1900. To some extent they spread beyond Lissadell and from time to time odd deer were seen in other parts of the County Sligo, but so far as is known none exists there to-day. The bodily weights of the deer killed were not recorded, but the heads remain as a memento of one of the most interesting experiments in the history of British Fauna.

At one time roe deer were also kept at Colebrooke Park in Ireland, but how they became extinct there I have been unable to trace. It is a curious fact, however, that, though roe deer in a wild state are well content with a very limited range of country, and though they often thrive in strict captivity, they do not as a rule flourish in parks or enclosed surroundings.

So far as can be ascertained, there is not a single roe deer living in Ireland at the present time under wild or semi-feral conditions, and from the zoological point of view the extermination of these beautiful little deer is greatly to be regretted.

A MONTH AT THE LABORATORY OF THE FRESHWATER BIOLOGICAL ASSOCIATION OF THE BRITISH EMPIRE.

By ANNA B. HASTINGS, M.A., Ph.D., Assistant Keeper, Department of Zoology.

LESS than a hundred years ago a romantic gentleman, realizing that his dream of living in a genuine mediaeval castle could never come true, determined to have one built for himself. He chose a magnificent site on the shores of Lake Windermere, and there his castle, with its thick stone walls, arrow-slits, battlements, and artificial ruins, grew up and became a landmark. As a home Wray Castle (Fig. 1) must have left much to be desired, but it provides excellent accommodation for the Laboratory of the Freshwater Biological Association of the British Empire, which is now established there. There are large rooms for library and laboratories, a cool and spacious basement where aquaria can be maintained, bedrooms for staff and visitors and a large boat-house, where the Association keeps a well-equipped motor-launch and a rowing-boat.

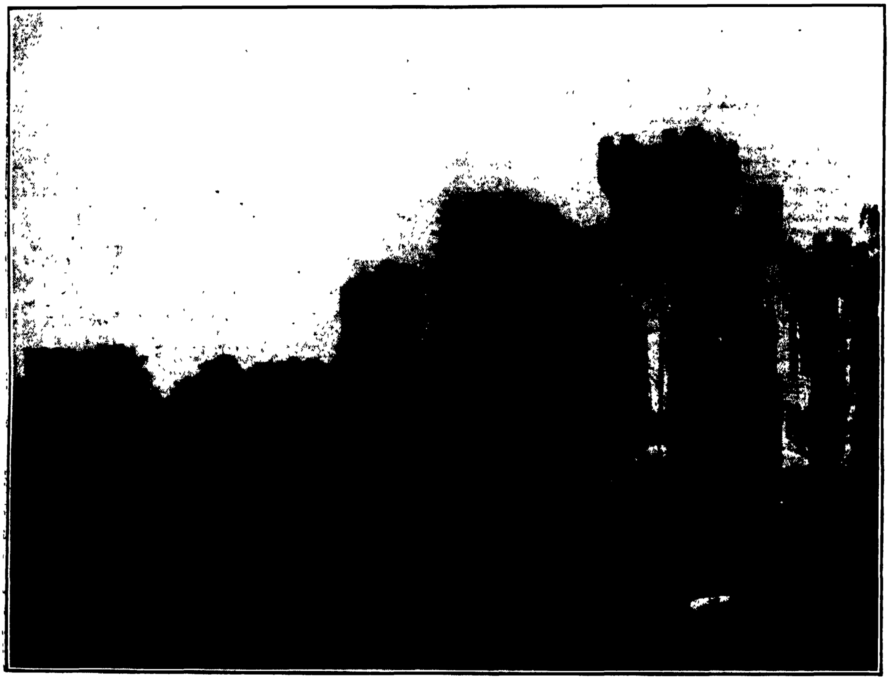


FIG. 1.—WRAY CASTLE.

Headquarters of the Freshwater Biological Association of the British Empire.

The Association was founded to promote the study and investigation of all aspects of life in fresh water. Its scope is thus wide, questions of great importance to mankind, such as water-supply, fisheries, and river-pollution, being inseparably connected with problems of the distribution, life-history, and migrations of the animals and plants, and the effect on them of changes and differences in the surrounding water. In this the first year of the existence of the Association's laboratory the resident naturalists have been working on several interesting problems, and a number of visiting workers have used the laboratory.

Copyright photograph by G. P. Abraham, Ltd.

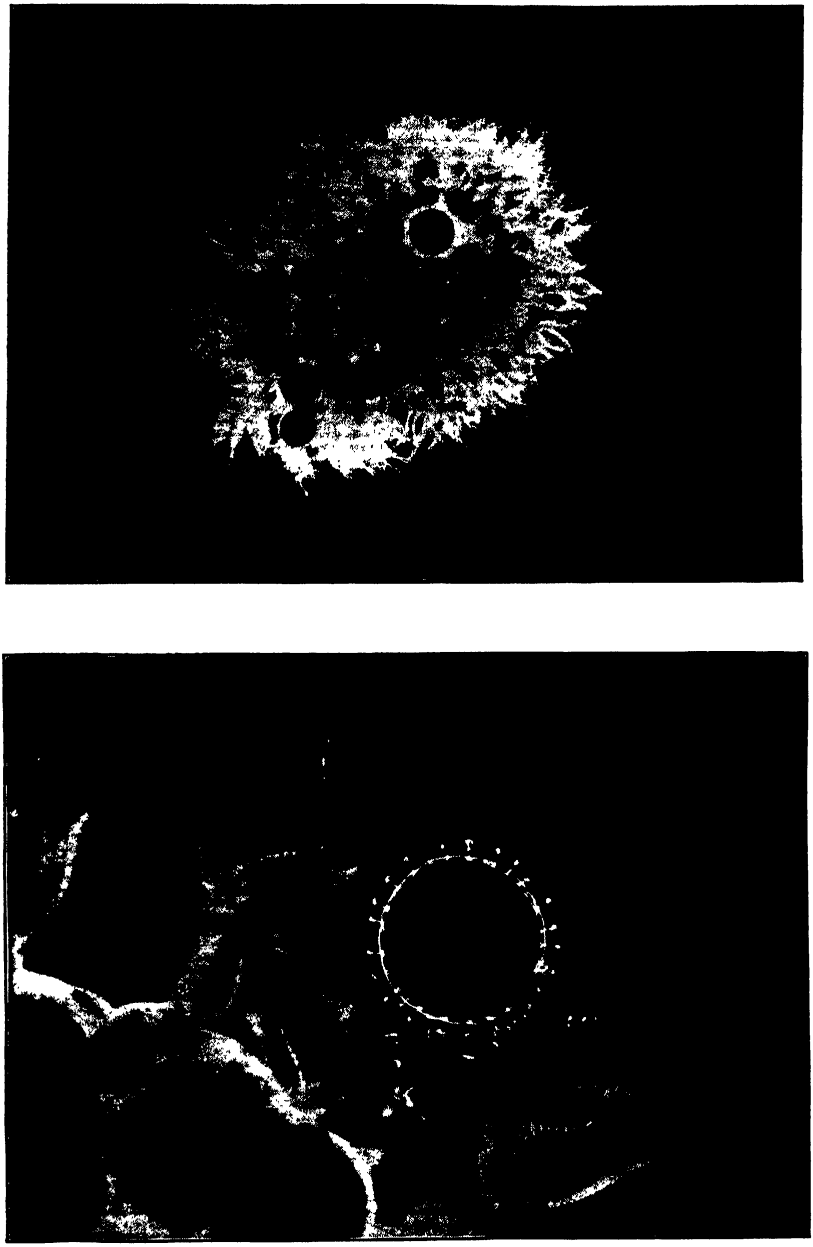
FIG. 2.—LAKE WINDERMERE, SHOWING LOW WOOD BAY AND LANGDALE PIKES.

The chief purpose of my visit was to study the Polyzoa of the Lake District. The freshwater Polyzoa look like minute plants. The majority consist of delicate, branching tubes, and the more compactly branched specimens have a mossy appearance, but, though the Polyzoa have this plant-like aspect, they are in reality colonies of animals. If left undisturbed in water, they extend numerous crowns of delicate tentacles, just visible to the unaided eye. Each crown belongs to one little animal, and by the beating of numerous minute hairs, or cilia, on the tentacles a current of water is created, by which food particles are carried to the mouth, situated at the base of the tentacles.

As nothing was known of the Polyzoa of the Lake District, my business on this first visit was to find out which species were represented and where they were to be found. For this purpose I visited as many lakes as possible and searched the different types of habitat. The most flourishing growth of Polyzoa was found in small, low-lying lakes, such as Esthwaite Water, Watendlath Tarn, near Derwentwater, and Loughrigg Tarn, near Grasmere. Such lakes are often very beautiful. On their shores there may be thick beds of reeds and bulrushes, lively with the calls and movements of warblers and reed-buntings. Yellow and white water-lilies float upon their surface. A moor-hen with her chicks may be surprised and occasionally the ripples in the wake of a pair of crested grebe scatter the reflexion of the mountains. Various Polyzoa live in such lakes. *Hyalinella punctata* (Hancock) forms " pale watery-green " patches as much as two inches in diameter on the under surface of dead branches and tree stumps in a few inches of water among the reeds. Three species may thrive in the stony parts of such lakes, namely, *Plumatella fruticosa*, *Fredericella sultana*, and *Paludicella articulata*. They grow on the under surface of stones, but the stones must rest on other stones, for if they are not clear of mud no Polyzoa are found.

Copyright photograph by Kathleen C. Pettitt.

FIG. 3.—GRISEDALE TARN.



Preparation by E. R. Newmarch. Photographs by J. G. Bradbury.
Reproduced by permission of E. R. Newmarch.

FIG. 4.—*Cristatella mucedo.*

(*Upper*) Whole colony, × about 6 times. (*Lower*) Part more highly magnified and a free statoblast.

The same species inhabit similar places in larger lakes such as Windermere (Fig. 2). They are, however, much less abundant, and the colonies are usually smaller and appear impoverished. The most obvious difference between the larger and the smaller lakes is the amount of wave-motion, and it may be that it is the disturbance caused by the waves which makes the larger lakes less favourable to Polyzoa. A constant current does not harm them, for extensive growths of *Paludicella* and *Plumatella* are found in the swift-flowing river Brathay.

The mountain tarns (Fig. 3) contrast strongly with the small, low-lying lakes. Leaving the valley with its woods and cultivation, one takes a steep track, often beside a rapid mountain stream. The bracken is soon left behind, the scenery grows wilder, and the wheatears become more numerous, flitting from stone to stone, bobbing and calling. Then after an hour or more, when the view is beginning to open out, one scrambles up the last steep slope, and there lies the tarn in the grandeur of its mountainous amphitheatre. Polyzoa were not found in the peaty pools in the upland bogs, but in some of the tarns, as in the larger lowland lakes, *Plumatella*, *Paludicella*, and *Fredericella* exist in rather impoverished form. In the highest tarns, such as the Red Tarn, perched on the slopes of Helvellyn, no Polyzoa were found. The freshwater Polyzoa die down in winter and only their statoblasts, small seed-like bodies with a hard protective shell, survive. When the temperature of the water rises in spring, the statoblasts sprout and grow into new colonies. Possibly the water in the highest tarns was not yet warm enough when I was there in July to cause the germination of statoblasts.

The most common Polyzoa in the Lake District have already been mentioned, but *Cristatella mucedo* (Fig. 4) was also seen. It is one of the few Polyzoa with the power of locomotion. The colonies are not branched like the other species found in the Lakes, but are of a regular, often elongate, oval shape. The tentacles are protruded from the convex upper surface. The under surface is flat, like that of a snail, and on it the colony creeps slowly over stones and plants. By the translucency and delicacy of its texture and the symmetry of the crowns of tentacles, such a colony is an object of real beauty.

Other interesting and beautiful forms of life abound in the waters of the Lake District, and specimens of various kinds were brought back to the Museum. It is to be hoped that the opportunities afforded by the Laboratory of the Freshwater Biological Association will enable us further to enrich the Museum collections.

THE JAVAN RHINOCEROS.

By J. GUY DOLLMAN, B.A., Assistant Keeper, Department of Zoology.

A SPECIMEN of the Javan Rhinoceros (*Rhinoceros sondaicus*) shot in the Kroh Forest, Perak, Malay States, in January of this year by Mr. Arthur S. Vernay, and presented by him to the Natural History Museum, has now been mounted at the donor's expense, and has been placed on exhibition in the south-east corner of the New Whale Room as a part of the exhibition of the Game Animals of the Empire. The specimen is of exceptional interest, being a very old female and showing that the horn, which was formerly thought to be developed only in the male sex, is found in the female sex in a rudimentary condition. The only other complete female specimen of this rhinoceros in the Museum collection is the one shot and presented by Mr. T. R. Hubback, and this exhibit shows no trace of a real horn such as is found in the present specimen.

There are three rhinoceroses occurring in Asia: the Great Indian Rhinoceros (*Rhinoceros unicornis*), an animal confined to the plains of Northern India, distinguished by the possession of a single horn and the fact that the fold of skin behind the shoulders does not pass over the back; the Javan Rhinoceros (*Rhinoceros sondaicus*), another one-horned species, in which the fold behind the shoulder passes right over the back; the Sumatran Rhinoceros (*Rhinoceros sumatrensis*), a two-horned species, in which the body is frequently fully haired. The latter species is the smallest of the Asiatic rhinoceroses, standing not more than 4 to 4½ feet at the shoulder, and the length from the muzzle to the root of the tail is only about 8 feet. The Sumatran Rhinoceros is found in Sumatra and Borneo, and occurs also on the mainland, extending from the Malay Peninsula northwards to Assam. The Javan Rhinoceros is a considerably larger animal than the Sumatran, but carries a much smaller horn than either the Indian Rhinoceros or the Sumatran. The record horn lengths for the three species are as follows: Indian Rhinoceros 24 inches, Javan Rhinoceros 10¾ inches, Sumatran Rhinoceros (front horn) 32½ inches. All these three specimens are in the Museum collection. The record specimen of Javan Rhinoceros was shot by Mr. Marius Maxwell on April 24, 1910, in the extreme western end of the island of Java; this area has since been declared a game reserve by the Dutch Government, and, so far as is known, few specimens of this rhinoceros still live there.

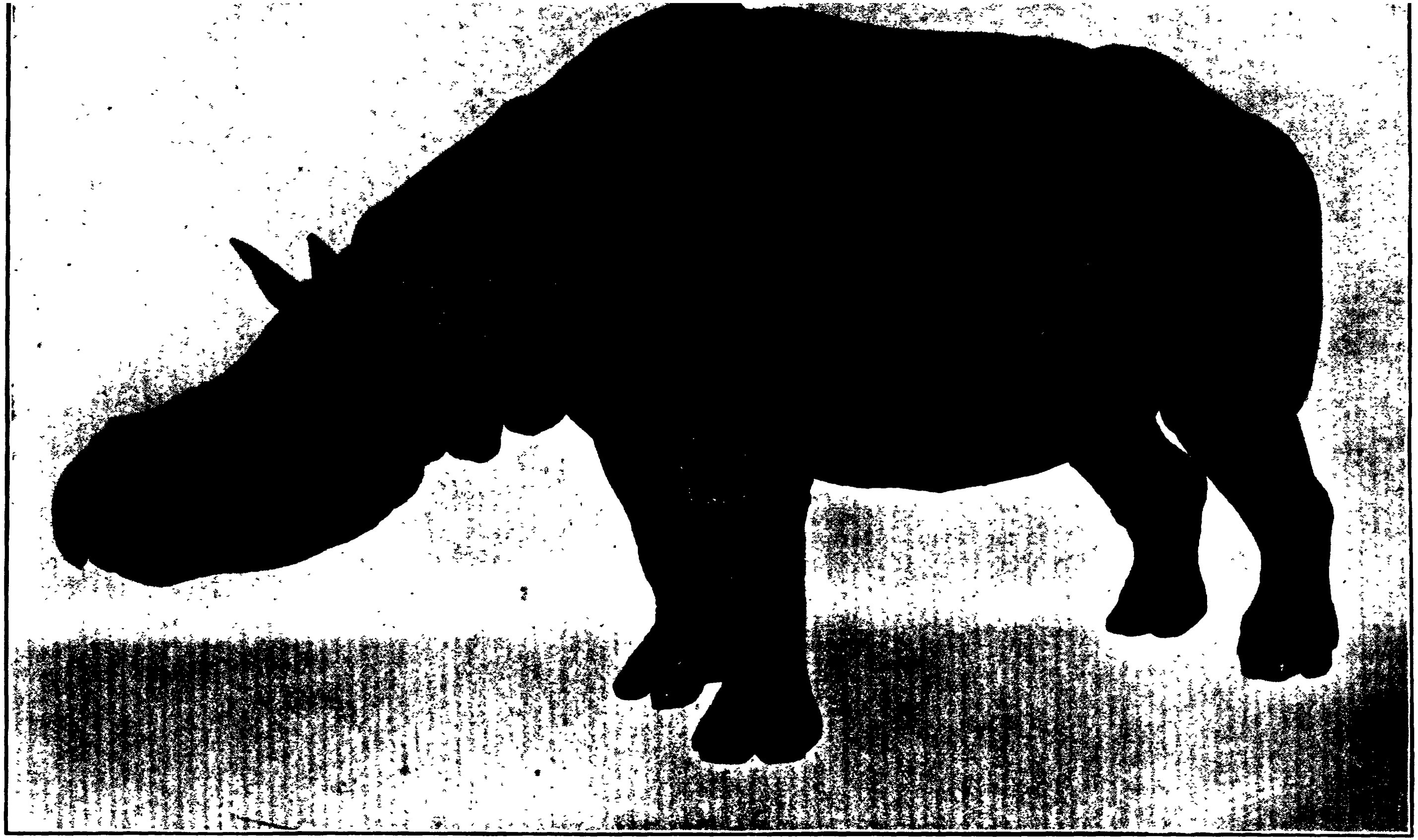


Fig. 1.—The Javan Rhinoceros (*Rhinoceros sondaicus*).

The specimen as mounted for exhibition.

The specimen shot by Mr. Vernay was an isolated example of the breed and could not have been of any use in perpetuating the species. It has been mounted in the studios of Rowland Ward, Ltd., and shows to advantage the mosaic-like pattern of the skin. Some of the epidermis has unfortunately become displaced during the transport of the specimen, but this defect has been remedied by the taxidermists, who have replaced the loose portions of skin and made the whole animal extremely life-like. It is the first fully adult example of this species that the Museum has received in a mounted condition. The only other specimen in the collection is the female referred to above, presented by Mr. Hubback, and a young mounted animal which has been on exhibition for a great many years. Other than these, the species is represented in the Museum collection only by skulls and skeletons.

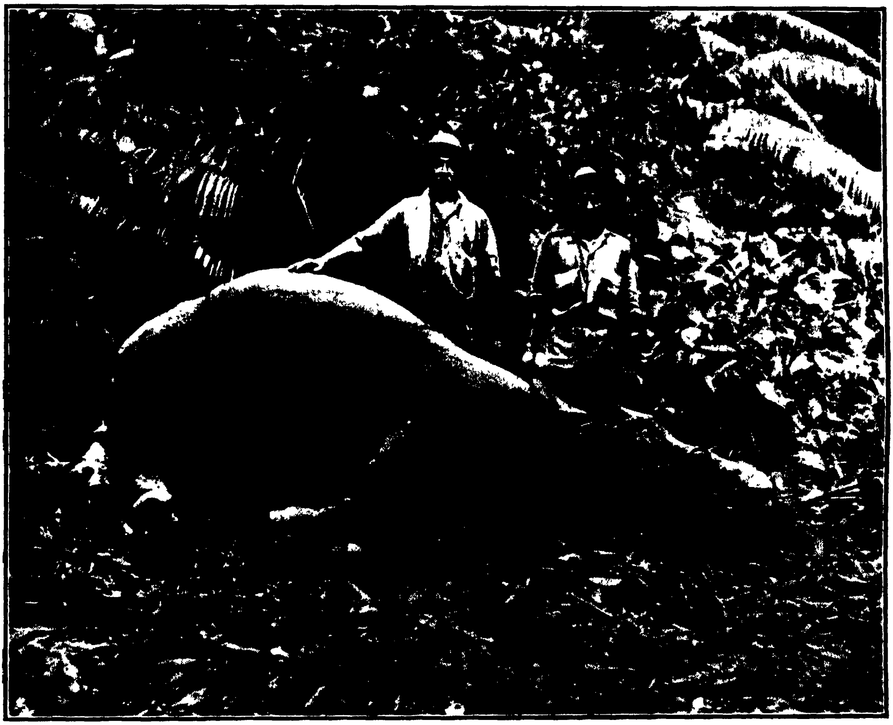


FIG. 2.—THE JAVAN RHINOCEROS, JUST AFTER IT WAS SHOT.

In addition to the mounted specimen Mr. Vernay has also presented the entire skeleton and skull of this rhinoceros; the skeleton has been preserved with great care and will be of great interest to all those working on this group of ungulates. A cast of the incipient horn has been prepared and will be available for study purposes.

Mr. Vernay's expedition to the Malay States included among its personnel Capt. Beresford Holloway, who made a large collection of mammals, fishes, butterflies, and other zoological specimens, which Mr. Vernay has kindly presented to the Museum. The collection contains some interesting monkeys, including a series of the agile gibbon, and the rare langur, *Pithecus femoralis.*

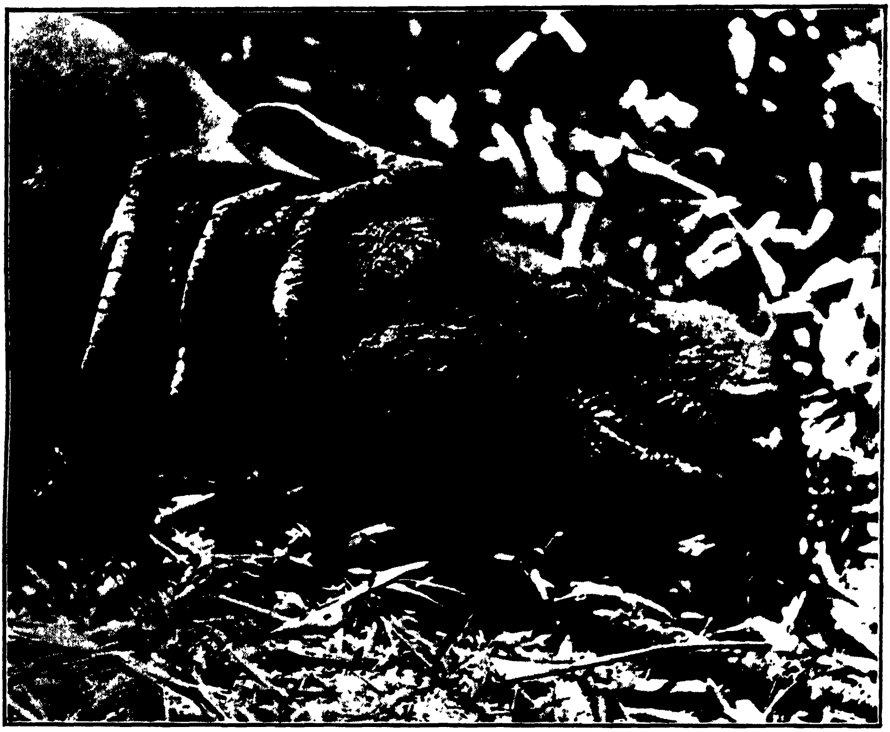


FIG. 3.—THE JAVAN RHINOCEROS.
Enlarged view of head, showing mosaic-like pattern of skin.

There are also some interesting Carnivora, the most outstanding of which are a series of lingsangs (*Prionodon gracilis*), a binturong (*Arctictis binturong*), and a number of civets and palm civets (*Paradoxurus hermaphroditus*). Among the Insectivora there are a fine series of the red tree-shrew (*Tupaia ferruginea*), and a specimen of the rare rat-shrew (*Gymnura rafflesii*). In addition, there are two specimens of cobego (*Galeopterus velans*), and amongst the ungulates seven specimens of chevrotain, representing two species, are notable accessions. The series of rodents is rich in squirrels, several examples of the genera *Callosciurus*, *Rhinosciurus*, *Ratufa*, and *Petaurista* being included. There are also many specimens of bats, both in spirit and skins, representing the genera *Cynopterus*, *Tylonycteris Taphozous*, *Scotophilus*, and *Hipposideros*.

The collection of mammals has not yet been worked out, so that it is not yet possible to say whether it contains any novelties. It certainly contains many examples of rare mammals required by the Museum collection.

WICKEN FEN.*

By W. H. T. TAMS, Assistant Keeper, Department of Entomology.

THERE are in the British Isles certain places, the names of which conjure up in the mind of the naturalist pleasant pictures of a happy hunting-ground. Such a haunt is Wicken Fen, lying inconspicuous in a wide expanse of apparently dull and uninteresting flat country; and it must be admitted that, to anybody but a naturalist, no spot is more likely to escape the attention of the passing traveller. Wicken village, charming as it is, gives no hint of the treasures to be found in the stretches of level country to the west and south.

Twenty years ago the approach by road to Wicken Fen from Cambridge, whence perhaps most pilgrim naturalists come, was by way of Waterbeach and the Upware ferry, and the approach to a knowledge of the Fen by reading was by way of stepping-stones of scattered information culled from various books and papers. These two avenues of approach have now been greatly improved: the first, by the opening of the new bridge shown in the photograph here reproduced (Fig. 1), and the second, by the comprehensive publication now under review. Collected together in this work we now have such a wealth of information that, while it is not easy to give an adequate idea of all that it contains, it is less difficult to pay tribute to those who conceived and carried out the enterprise.

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* *The Natural History of Wicken Fen.* (Cambridge: Bowes & Bowes.) Edited by Prof. J. Stanley Gardiner, F.R.S., and A. G. Tansley, F.R.S.

Part I. Pp. 1–64, with map of Wicken and Burwell Fens. 1923. 3*s*. 6*d*. Edited by Prof. J. Stanley Gardiner, F.R.S.

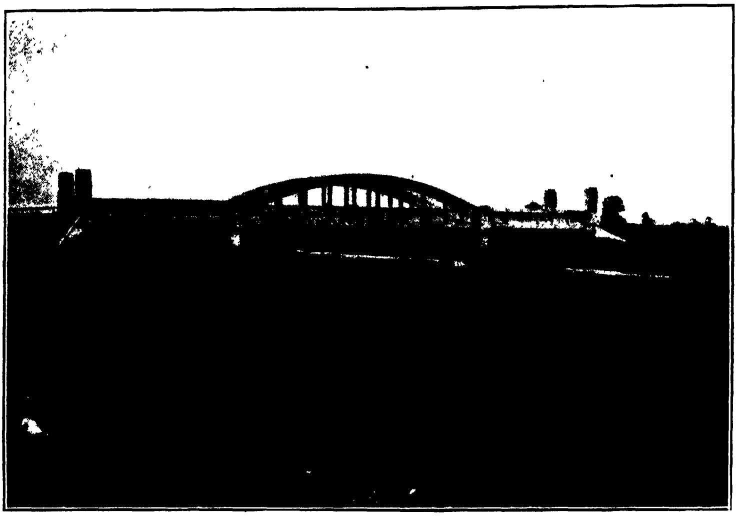
Part II. Pp. 65–172, with plates I–IV. 1925. 6*s*.

Part III. Pp. 173–266, with plate V. 1926. 5*s*.

Part IV. Pp. 267–384, with plates VI–IX. 1928. 6*s*.

Part V. Pp. 385–488, with plates X–XIII. 1929. 5*s*.

Part VI. Pp. 489–652, with plate XIV. 1932. 7*s*. 6*d*.



Photograph by the Author.

FIG. 1.—NEW BRIDGE OVER THE RIVER AT STRETHAM.

Photograph by the Author.

FIG. 2.—WICKEN VILLAGE.

The six parts, which have appeared at intervals since 1923, contain fifty-six articles of a varied nature. Some are up-to-date lists of the animals and plants of the area, others are less

Photograph by the Author.

FIG. 3.—HARRISON'S DROVE, WICKEN FEN.

Photograph by the Author.

FIG. 4.—VIEW ACROSS HARRISON'S DROVE, LOOKING TOWARDS WICKEN VILLAGE.

exhaustive accounts of certain groups, and in addition there are several general articles which make excellent reading.

Those who are interested in the various aspects of their own countryside cannot fail to derive pleasure from "The Fens of the Great Level, their Drainage, and its Effect on the Flora and Fauna," by A. H. Evans; "Wicken and Burwell Fens Fifty Years Ago and Now," by A. H. Evans; "Memories of Wicken," by W. Farren; "A Note on the Levels of the Fens Around Wicken," by W. S. Farren; "Wicken Fen," by J. Stanley Gardiner; "The Vegetation of Wicken," by H. Godwin and A. G. Tansley; "The Fen Fire of 1929 and its Effects on Vegetation," by H. Godwin; "Plant Life on Wicken (A Review of Recent Work)," by H. Godwin; and "Wicken Fen Fauna—A Review," by L. E. S. Eastham.

Photograph by the Author.

FIG. 5.—WICKEN LODE.

The progress of the acquisition of Wicken Fen by the National Trust for Places of Historic Interest or Natural Beauty is shown in a table on p. 52, and it appears that the Trust now holds some 521 acres, for the benefit of the nation. There remain about 60 or 70 acres to be purchased when funds become available for this purpose.

A perusal of the papers dealing with particular groups conveys the impression that, although some groups are fairly well known, there is everywhere plenty of opportunity for further investigation, and in certain cases, for instance in the Fungi, Oligochaeta, Nematoda, Diptera, etc., the scope for further researches is wide.

It may be useful to point out certain facts to which particular attention is devoted in some of the papers.

It has been found necessary to keep an area of the Sedge Fen nearest to Upware as a sanctuary for birds and a breeding-place for insects. Certain insects are stated to have definitely increased in numbers as a result of this.

Photograph by the Author.

FIG. 6.—WICKEN LODE (ANOTHER VIEW), WITH WICKEN VILLAGE IN THE BACKGROUND.

On three occasions considerable damage has been caused by fire, which has arisen apparently through the carelessness of smokers, and smoking is now forbidden in the Fen.

It does not seem to be generally understood that, although the Burwell–Wicken fenland area is the only part of the Great Level—which extended roughly from Lincoln southward to Cambridge and from Huntingdon eastward to Lakenheath—remaining in its primitive condition, it has been definitely affected by the intervention of man. Although it has not been cultivated in the ordinary way, for centuries the sedge has been cut for thatch. The gradual falling off in the demand for sedge for thatch during the last half-century seems likely to result in the reversion of the Sedge Fen to brush, unless steps are taken to keep up regular cutting. Whereas in earlier days cutting was profitable, to-day it has to be done at some expense in order to preserve the fen and its peculiar flora and fauna. The grass *Molinia*, which used to be cut for litter, also provides a problem, as the four-yearly cutting of the mixed sedge (*Cladium* and *Molinia*), usually carried out in the winter, appears favourable to the increase of *Molinia*, and tends to kill out the sedge (*Cladium*). In spite of the definite statement that winter cutting does not injure *Molinia*, and is injurious to *Cladium*, no suggestion for the summer cutting of the mixed sedge for litter, in the hope of avoiding the killing out of the *Cladium*, seems to be put forward in any of the articles.

In their introductory remarks to the first article on the Coleoptera of Wicken Fen, Omer-Cooper, Perkins, and Tottenham state that: "Our ignorance of the natural history of the majority of the Coleoptera is so profound that, if the group is to receive adequate treatment, the co-operation of many workers is necessary to supply information on habits, relative abundance, etc., etc., as well as to record the names of captured species." It is to be feared that this ignorance is not by any means confined to the coleopterists, and that even in the case of the Lepidoptera, although many life-histories are known, much remains to be done, especially among the smaller moths.

The introduction of *Chrysophanus dispar batavus* into Wicken Fen appears to have been successful. While such an experiment can conceivably do no harm, the native stock of the Large Copper having long since died out, it may not be out of place to say here that the indiscriminate release of Swallow-tail butterflies may be fraught with consequences of a kind not to be feared in the case of either the Large Copper or the Camberwell Beauty. It is particularly unfortunate that, when those responsible for the care of Wicken Fen and other nature reserves are doing their utmost in the face of great difficulties to preserve unaltered some of our most interesting insects, continental specimens of the Swallow-tail butterfly have actually been released in this country by irresponsible people, thus endangering the purity of the native stock.

The writer remembers encountering at Wicken some twenty years ago a collector who, day after day, went out and took every caterpillar of the Swallow-tail on which he could lay hands. Thanks to the generosity of those who have made it possible for the National Trust to acquire the fen, this type of collecting has stopped in that area, though it may still be met with elsewhere.

An examination of what has been already achieved, and a perusal of the suggestions for future work, both force one to the conclusion that it is only in such a place as Wicken Fen, situated as it is within easy reach of the botanical and zoological departments of the University of Cambridge, possessed of a flora, fauna, and conditions which attract not only students from the University, but naturalists from all over the country, that one can hope for a continued and fruitful attack on at least some of the many problems that confront the present day biologist and ecologist.

BOOK NOTICES.

Biology, an Introduction to the Study of Life. By H. MUNRO FOX. Pp. xvi + 344, with 153 illustrations. (Cambridge: University Press. 1932. 6*s*.)

THE writing of an elementary book on biology is a difficult matter. We all think we could do it much better than those who actually undertake the task, but, when we come to think the plan out, criticism of others' work is almost silenced. There are so many ways of doing it that it is hard to decide what to leave out, how to make a well organized development of the ideas.

Professor Fox's book has been written " in part to conform with the requirements of the School Certificate Examination and of Biology as a Subsidiary Subject in the Higher Certificate. . . . But it is hoped that the book may also prove a readable outline of biology for those of more mature years who are not studying for any examination." It covers the ground in a very workmanlike way and introduces many topics that are not usually found in works of this kind. Oddly enough, it makes only a very brief allusion to the phenomena of heredity and gives no description of even the simplest genetical laws.

The subject is treated with freshness and vigour, though the somewhat staccato style (*cf.* the opening paragraph of the first chapter) is apt to be a little irritating. The illustrations are exceptionally well chosen. We are at a loss to discover why the alleged figure of the Frog's skin (fig. 21, no. 2) displays hairs. There are some errors in fact of fact and expression to be noted: the tapir does not live " only in Borneo and Central America " (p. 316) and one should not invite a student (p. 250) to examine fish scales " under the microscope mounted in glycerine " !

But after all the chief question is—does the book develop the general theme well and present the ideas coherently and on a well organized plan? We think it does, though we would venture to make three criticisms. There is no general account of the characteristics and properties of living matter. Although the first three chapters are devoted to describing the essential vital processes, the question of reproduction makes its first appearance rather incidentally in the description of the Frog (ch. iv). Finally, we think that Professor Fox should not be so positive in some of his assertions as to the efficacy of natural selection.

Bees, Wasps, Ants, and Allied Insects of the British Isles. By EDWARD STEP, F.L.S. The Wayside and Woodland Series. Pp. xxv + 238; with 44 plates in colour showing 470 figures, 67 plates showing 170 photographic reproductions and text illustrations, also 64 wing-maps. (London and New York: Frederic Warne and Co., Ltd., 1932. 10*s.* 6*d.*)

THE primary purpose of popular books must always be to arouse interest in a subject. Judged from this point of view, which is generally the only way in which popular books can be judged, this book is a valuable addition to the admirable Wayside and Woodland Series.

In a successful popular book of this kind the illustrations are of the greatest importance, as illustrations are not only more attractive but also more accurate and more easily remembered than the text matter. The numerous beautiful coloured plates and figures together with photographs will be a tremendous stimulus to further study of the Hymenoptera. The introductory part of the book includes eight pages of wing-maps, depicting the venation in the forewings of sixty-four different Hymenoptera of most of the commoner groups. These figures are taken from well-known authorities and should be of very great service. In the main body of the book the numerous coloured photographs, mostly of dried adult insect specimens with the wings spread out, show very well the range of general colour and form. Two coloured plates are given to sawfly larvae. There are collected together some very beautiful photographs illustrating the life habits and immature forms, and other much enlarged photographs to show a few of the more striking details of wings, legs, etc.

The greater part of the text is devoted to the large, conspicuous, nest-making Hymenoptera, and the chapters are divided according to their biological habits. In many of these groups the species are dealt with individually and have been given popular English names. The vast majority of the Hymenoptera that form the parasitic groups can, of course, hardly be touched upon in a work of this kind; but it should be impressed on the beginner that perhaps the small inconspicuous insects are after all the most important and the most interesting.

In a classified index at the end the genera that are dealt with are tabulated in their superfamilies largely according to the system adopted in Imms' " Text-book of Entomology." A list of " Useful Books for Reference " is also included, and these books are largely the source of much of the text matter. Unfortunately, many slight misunderstandings of what was meant by these authors have here developed into misleading statements, and, again, errors in the original authors are perpetuated here. It is a pity also that in works of this kind the nomenclature should always be so out of date, as it means that any beginner who learns from this book will have to unlearn afterwards many of the names with which he has by then become acquainted. The student who wishes to recognize the insects for certain will, of course, find both the figures and the descriptions very inadequate. Anyone who is already acquainted with some of the insects will find the frequent omission of the familiar Latin names from under the coloured plates and the substitution of often newly-invented and sometimes inappropriate English names a great inconvenience. Such names as " The Notable Yellow-faced Bee " and " The Five-banded Tailed-digger Wasp " are examples of the author's ingenuity.

Bird Haunts in Wild Britain. By R. N. WINNALL and G. K. YEATES. Pp. x + 215, with 31 plates. (London: Philip Allan & Co., Ltd. 1932. 10*s.* 6*d.*)

IN recent years a large number of books with photographic studies of birds have appeared, and in the majority of them the letterpress is not up to the standard of the illustrations, since the authors are more concerned with taking good photographs than making observations of the birds at close quarters. In the present work, however, the authors are keen ornithologists, who have made good use of their opportunities to learn what they can of the different birds, in addition to taking good pictures, with the result that the letterpress is full of interest.

The book is divided into nine chapters, and each is devoted to a certain type of country and one or more of the characteristic birds inhabiting it are dealt with. Under " Common Marshland Birds " we have the Lapwing, Snipe, and Redshank, while " Social Life in the Tree-tops " gives some original observations on the domestic economy of the Rook; and " By Northern Lochs " contains interesting notes on our two British-breeding Divers and Common and Black-headed Gulls.

In the introductory chapter the authors give a well-balanced account of bird protection. They point out the harm done by the indiscriminate taking of eggs and the shooting of birds by " collectors," who amass specimens as a hobby and not for a purpose. On the other hand, they draw attention to the almost equal harm done by well-meaning people in the over-protection of some species. If the birds themselves could be consulted we doubt very much if they could say which they suffer from most—the greed of the one or the ignorance of the other ! When collecting is carried out in the right spirit and for an increase of knowledge, *i.e.* science, no harm is done; and likewise if birds are protected on common-sense lines the birds greatly benefit.

The Brachyuran Crustacea of North China. By C. J. SHEN. Zoologia Sinica A, vol. ix, fasc. i. Pp. 300, with 10 plates and 171 text-figures. (Peiping, China : Fan Memorial Institute of Biology. March 15, 1932.)

THE Crustacea of China, and particularly of the northern region, are very imperfectly known. It is fortunate therefore that the Chinese themselves are now making good the deficiency.

Mr. Shen's monograph deals with collections from the Pechili Gulf region. The total number of species (sixty-eight, of which twenty-one are new) is small for such a large area and does not compare favourably with that of a single collection from Hong Kong. This may be due to : (1) the fact that the fauna undoubtedly gets poorer in more northern waters; or (2) the possibly less favourable conditions inside the Gulf. The relatively high percentage of new forms, in addition to revealing the incompleteness of our previous knowledge of this region, suggests that the fauna may be rather distinct from that of the rest of the Indo-Pacific area.

The difficulty of comparing material with inaccessible type specimens has been overcome with the help of many carcinologists, to whom Mr. Shen has made ample acknowledgment in his introduction. It would have enhanced the value of his work, however, if he had also stated under each species where the type is and who had re-examined it.

The text-figures are so exceptionally good that the plates might easily have been dispensed with, since photographs rarely show essential specific characters. Apart from a few infelicities of style, Mr. Shen has successfully embodied his results in a foreign and widely different language. His volume will serve as a useful work of reference for future students of Chinese crabs.

Do you speak Chimpanzee? By G. SCHWIDETZKY. Translated from the German. Pp. viii + 132. (London : George Routledge & Sons, Ltd 1932. 6*s*.)

THIS is an original book. The author is a German philologist who has set out to bring philology into line with the natural sciences by investigating the speech of animals. His thesis is that the study of the sounds made by animals will throw light on the origins of human speech. This is a new departure, and we should, therefore, welcome it as a stranger. Unfortunately the author's enthusiasm is such that he has not much regard for logic or facts. He begins with a statement of his views on the ancestry of man and the higher apes, and he traces three lines of evolutionary descent: (1) primitive circopitheques, (2) the lemur, Endrina, (3) primitive baboons. Man and the higher apes are the result of what he calls bastardy or crossing between these three strains. The chimpanzee is for him a composite picture, a synthesis of them all. Neanderthal man is the result of a cross between a primitive baboon and a primitive gibbon. In his own words, "anthropoid apes are bastard forms of lower monkeys, and men are the bastards of bastards. The greater the degree of bastardy, the more closely do they modify each other and the more human does the new being become." Anyone unkind enough to inquire what evidence there is for all this he refers to the miscegenations of animals in Zoos, when normal sexual outlets are denied to them. Moreover, it explains the fact of the mingling of the blood-groups in the higher apes.

He gives a very entertaining account of the history of the study of what he calls animal languages, and we must be grateful to him for introducing to us Pierquin de Gembloux, an early nineteenth-century French schoolmaster, who compiled the first dictionary of animal words, called "Idiomologie des animaux." He also describes the attempt of the American, Garner, to teach a chimpanzee human speech. "The position of the lips for the word *Mamma* was correctly imitated, but no sound was made; the French word *feu* became *üo*, the German *wie*, *üu*, and the negro word *ngkwe* evoked no response whatever." Strange! He tells the touching story of Dr. Furness and his little female orang. Dr. Furness took her to a bathing-pool on a hot summer's day, and when she got her legs wet she flung her arms round him in terror and kissed him again and again, repeatedly crying "Papa, Papa." Finally, I cannot resist quoting the account of Laqueur's experiment on the hearing of frogs. Laqueur first hypersensitized seventy frogs by means of strychnine injections. "He then whistled, rang a bell, clapped his hands and croaked in their presence. Fifty of the animals did not stir, but the other twenty responded to one or other of the sounds by a certain amount of movement."

It is not very clear what the author means by animal speech. He quotes at the outset Schuchardt's definition of speech as the communication of what is thought, felt, and willed, and claims that in this sense animals speak. He points out that expression—the groan, and the cry of pleasure—exists before the rise of communication. We are told that it is not unlikely that the grunts of fish are the basis of similar utterances in amphibians, reptiles, and mammals, above all, in monkeys and men; and that the reason why fishes cannot articulate the human *r* is that the uvular *r* is impossible as they lack a uvula, the tongue tip *r* is impossible as their tongues cannot be moved, while a glottal trill is impossible as they have no larynx.

The reptiles and amphibians are dealt with in a similar manner. When the reader has been wondering for some time what these animal noises have to do with the expression or communication of what is thought, felt, or willed, the author changes his front and describes them as the accompaniments of the acts of breathing and feeding. The utterances of fish, however, are in the nature of our sighs and groans, which we ourselves scarcely ever perceive, and they are significant to the prehistory of speech, "for when hearing develops and directs attention upon uttered sounds, these sounds are transformed into speech."

The section on mammals is a little more convincing, and he claims, probably justly, that among the higher mammals there is a fixed association between certain cries and certain experiences, and thus something like words in the human sense exists.

The author is, of course, aware that nearly all animal speech is inherited and human speech laboriously acquired, but this presents no difficulty to him, for he claims that what he calls inherited human speech or the sounds made by infants is composed of monkey sound-groups. He does not point out the curious fact that inherited human speech is quite unintelligible to humans, and as a means of communication seems to be on a lower level than the speech of apes.

However, nothing daunts the author and he goes on to introduce some extremely ingenious simian philology. Thus the Latin word *testa*, which in one of its meanings is the shell of shell-fish, is derived from the indrawn *tsts* and *a*, which are cercopitheque words, and cercopitheques are crab and shell-fish eaters. The Latin *aurora* comes from the *ur-ur* of lemurs, the sound with which they welcome the dawn. The German words *gang* and *knacken*—to crack (nuts)—are derived from the chimpanzee words *ngak ngak*, and so on.

The book is full of new ideas and stimulating suggestions of all kinds and is well worth reading, but it is written on the principle that measles, Margate, and metaphysics are akin, because they all undoubtedly begin with an *m*.

Sketching in Pen and Ink. By DONALD MAXWELL. Pp. 132, with numerous Illustrations. (London: Sir Isaac Pitman & Sons, Ltd. 1932. 7*s.* 6*d.*)

THIS little volume should appeal to all interested in pen-and-ink work. It is divided into five parts, of which the first deals with the problem of perspective and further shows the value of pen work on such an ordinary subject as a brick wall. The instruction as regards the drawing of a circular building is exceptionally valuable, as is the advice as regards pens and paper needed for the work.

The illustration of Winchester Cathedral combined with the two fragments of the same illustration, published on the opposite page, make a most instructive display concerning the modification that reduction in size renders.

In part two we are concerned with the technique in pen line and the planning of the picture. Here I think that the old-fashioned view-finder would be of great assistance; it prevents the panoramic tendency and centres the attention on the main subject of the sketch.

Part three deals with the problem of design, with a view to successful reproduction, and part four concerns the imaginary treatment of sketching in pen and ink. In this latter section we are introduced to the use of "Burlingham" grey paper, and the series of illustrations concerning the paper entitled "Twilight" is most instructive. The assistance of the paper to the artist is obviously of the first importance.

Concerning the fifth part of the volume, entitled "A Gallery of the Work of Some Living Masters of Pen and Ink," one is pleased to note the inclusion of works by Frank Brangwin, Bernard Partridge, Frank Reynolds, L. Raven Hill, George Morrow, Fred Pegram, and Arthur Watts.

RECENT IMPORTANT ALTERATIONS AND ACQUISITIONS.

Following upon the appointment of an Official Guide-Lecturer on a whole-time pensionable basis the Trustees have taken the opportunity of giving the public on Mondays at noon an opportunity of attending lecture tours by members of the Scientific Staff which are of a much more advanced character than the general tours by the Guide-Lecturer. The series began on October 3. The lectures for each month will be announced in the official publication on National Museums and Galleries issued by His Majesty's Stationery Office.

Department of Zoology.

A mounted specimen (see p. 273) of the Javan Rhinoceros, shot by the donor in Perak, Malay States; presented by Mr. A. S. Vernay.

A collection of twenty-four mounted heads of African antelopes (including the rare Heuglin's Gazelle, Soemmerring's Gazelle, Sudani Roan Antelope, Tora Hartebeest, and Sudani Kudu from the Sudan, and Jackson's Hartebeest from Uganda) shot by the late Mr. H. Leney; presented by Mrs. Frances E. Leney.

An important collection of about 800 birds made by Mr. G. L. Bates in French Niger and French Sudan, chiefly in the desert and arid country between Timbuctoo and the bend of the Niger; purchased.

Department of Geology.

An important series of microscope preparations, showing most of the early stages in the life-history of the graptolite *Climacograptus*, made by Mr. Ian Cox from material which he collected from rocks of Ordovician age in Akpatok Island, Ungava Bay, Northern Territory, Canada; presented by the Sedgwick Museum, Cambridge.

Department of Mineralogy.

A large series of rocks and minerals collected by the donor in Co. Antrim, Northern Ireland, Co. Louth, Irish Free State, and near Bristol; presented by Mr. W. Campbell Smith, M.C., T.D., M.A.

A small sapphire (5·1 carats in weight) with the prismatic habit of ruby, and a faceted orthoclase (30 carats in weight), clear with a faint, yellowish tinge and a slight blue schillerism, from the Ruby Mines, Mogok, Upper Burma; purchased.

Department of Botany.

The extensive herbarium formed by the donor's brother, the late Dr. Symers Macvicar; presented by Miss K. B. Macvicar. The herbarium, amounting to about 18,000 specimens, is general in scope and includes an unrivalled representation of the flora of Western Scotland, particularly the less-frequented parts of Argyll and Inverness. The most interesting portion of it is the liverwort collection, in which group Dr. Macvicar was the recognized authority in this country; it includes the very complete series of British Species on which he based his book, "The Students' Handbook of British Hepaticae." There are also extensive series of foreign specimens.

A series of about 1,200 plants collected in Greek Macedonia near the Albanian frontier by Mr. A. H. G. Alston and Mr. N. Y. Sandwith; the area was previously almost unknown botanically.

STAFF NEWS.

On October 19 Major E. E. Austen, D.S.O., will retire from the Keepership of the Department of Entomology on reaching the age limit of sixty-five years, having been born on that day in the year 1867. He entered the Museum as a Second Class Assistant (old style) on October 30, 1889, in the Department of Zoology, before the Department of Entomology was separated from it, and therefore will complete nearly forty-three years in the service of the Trustees. He succeeded Dr. C. J. Gahan as Keeper of the Department of Entomology on January 20, 1927. An account of his career is given in the *Natural History Magazine*, 1927, vol. i, p. 32.

* * * *

The Trustees of the British Museum have appointed Miss M. R. J. Edwards, B.Sc., Official Guide-Lecturer at the Natural History Museum. Miss Edwards was educated at Cheltenham Ladies' College and at King's College, London, where she graduated with second-class honours.

* * * *

Mr. William Henry Ravenscroft Holl, who died at Ealing on September 12, was in the service of the Trustees of the British Museum for forty years, from September 15, 1880, to September 30, 1920, for the first five years at Bloomsbury and for the remaining thirty-five years at South Kensington, where for many years he was clerk in charge of publications and stationery. Mr. Holl was born on November 20, 1854, the eldest son of William Holl, the etcher, and at his death was in his seventy-ninth year. An active member of the Artists' Rifles from 1877 to 1907, he held the Volunteer medal for long service; during the War he joined the United Arts Volunteers. The Museum was represented at the funeral service at Christ Church, Ealing, on September 15 by Dr. C. Tate Regan, F.R.S., Dr. W. T. Calman, F.R.S., and Dr. G. F. Herbert Smith.

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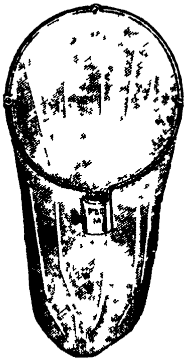

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Natural History Magazine

No. 25 JANUARY, 1933 Vol. IV

THE ROYAL SCOTTISH MUSEUM, EDINBURGH.

By PERCY H. GRIMSHAW, F.R.S.E., Keeper of the Natural History Department, Royal Scottish Museum.

THE Royal Scottish Museum was established in 1854 under the name of "The Industrial Museum of Scotland." The cost of a site was voted by Parliament, and while the present building was in course of erection several houses in the immediate neighbourhood were adapted and utilized as a temporary Museum, open to the public. The foundation stone was laid by the Prince Consort in 1861, and four years later the eastern half of the building was completed. This section was opened by His Royal Highness the Duke of Edinburgh on May 19, 1866, the name having been previously changed to "The Museum of Science and Art." The second portion was opened in 1876, and the west wing in 1888. In 1904 the name was changed once more, to the title it now bears. The institution is now directly under the control of the Scottish Education Department, and is maintained from public funds voted annually by Parliament. There are four separate Departments:—(1) Art and Ethnographical; (2) Natural History; (3) Technological; and (4) Geological. Each of the first three is under the charge of a Keeper, the fourth under an Assistant Keeper. There is also a well-equipped Library of some 30,000 volumes, under the care of an Assistant Keeper. The Museum is open daily, free of charge, from 10 a.m. to 5 p.m., on Saturdays to 9 p.m., and on Sunday afternoons from 2 to 5. The Library is accessible to the public on week-days.

The main entrance of the Museum is in Chambers Street (Fig. 1). Upon entering, the visitor finds himself at once in the Main Hall, of which we give two illustrations (Figs. 2 and 3). The ground floor of this Hall is devoted mainly to casts of Greek and Roman Sculpture, examples of Indian Architecture and Sculpture, reproductions of objects of Mediæval and Renaissance Art, specimens of Furniture and Woodwork, and collections of Coins. Along the front of the Main Hall runs a corridor containing, on the east of the main entrance, examples of metal work, and on the west, collections of medals and postage

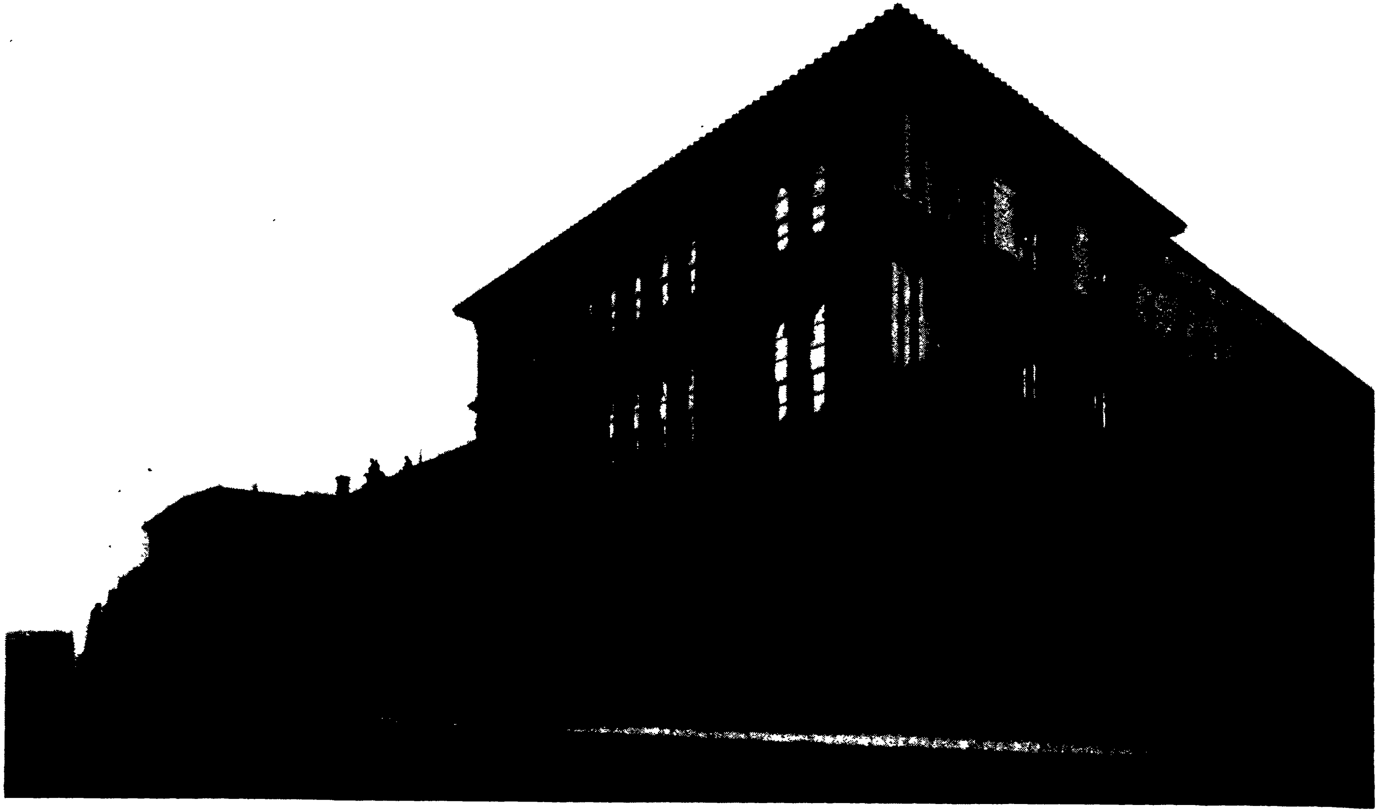


FIG. 1.—ROYAL SCOTTISH MUSEUM, EDINBURGH. CHAMBERS STREET FRONTAGE.

stamps. At the north-east corner of the building is a room containing Furniture of various periods, with a fine Flemish tapestry of early sixteenth-century date, portraying the Triumph of Prudence.

Running off at right angles to the Main Hall and opposite to the main entrance is a large Hall (Fig. 4) containing several large casts of European Architecture and Sculpture; a group of sculptured stones representative of Early Christian Art; and the main collection (including the "Sir Noel Paton" collection) of European Arms and Armour. In this Hall have been left, in their original and undisturbed positions, two portions of the old wall which was erected for the defence of the City of Edinburgh soon after the battle of Flodden.

To the east of the Hall just referred to runs a series of six large Halls devoted to Natural History. The first two of these are reserved entirely for British Animals, the one containing the Birds and the other the rest of the British Fauna. The Bird collection is a very fine one, containing nearly all the native species in various stages of plumage, and including several nesting groups in natural surroundings. An example of the Great Auk is exhibited, with its egg, as are also many other extremely rare species. The British Animal Hall adjoining contains representative series of Mammals, Fishes, Spiders, Insects, and Marine Invertebrates. Specimens of the Soay or St. Kilda Sheep, the "Wild" Goat of Scotland, the so-called Wild Cattle of Cadzow, and many rare Fishes may be seen in this Hall.

Passing eastwards we now enter the Antelope Hall, where will be noticed an exceptionally fine mounted example of a Baringo Giraffe, with a Nubian Giraffe in the same case. In the same Hall is also a splendid family group of the Alaskan Moose, set in natural surroundings, and including a male, female, and calf. The wall-cases contain a valuable series of Deer and Antelopes, also models of a typical set of Whales.

Passing through to the south the visitor now enters a Hall set apart for the display of remains and restorations of Extinct Vertebrates (Fig. 5). In the centre of this Hall is exhibited a cast of the skeleton of *Megatherium*, the Giant Sloth from South America. The actual skeleton of a gigantic, extinct, armoured mammal, the *Glyptodon*, may be seen in the rear. The wall-cases are at present undergoing revision, but when completed this Hall should appeal very strongly to the imagination of the visitor.

East of the Extinct Animal Hall is a room given up to

Beasts of Prey, and here one finds several pictorial groups, such as Walrus, Elephant Seal, Jackals, Wolverine, and Otter.

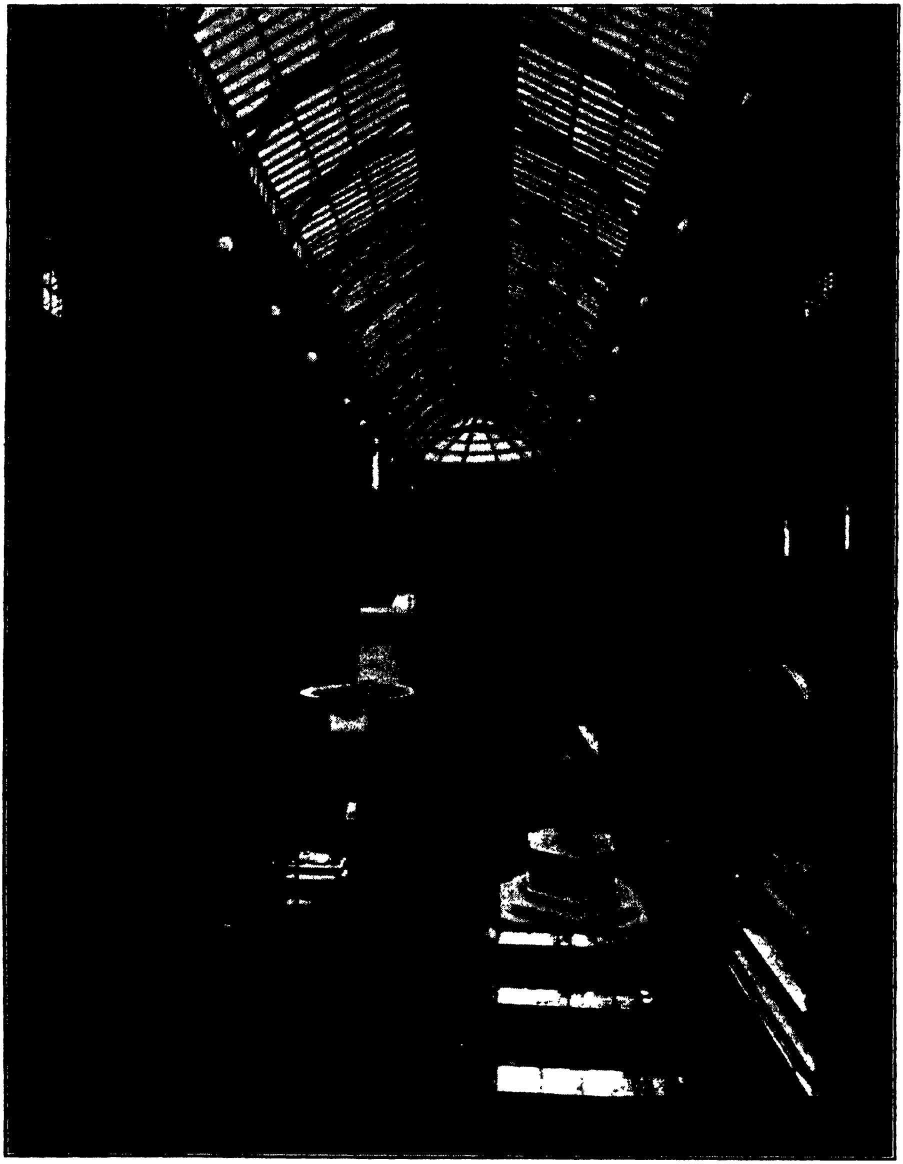


Fig. 2.—Royal Scottish Museum. Main Hall, looking West.

Polar Bears and Lions are each exhibited in natural setting, while a series of Heads of Hoofed Animals, arranged according to continents, fills up the wall on the western side.

The Great Mammal Hall, shown in our illustration (Fig. 6), is now entered, and here the visitor will find the remainder of the Mammals arranged systematically. Many rare species are exhibited, including a fine mounted example of the Quagga,

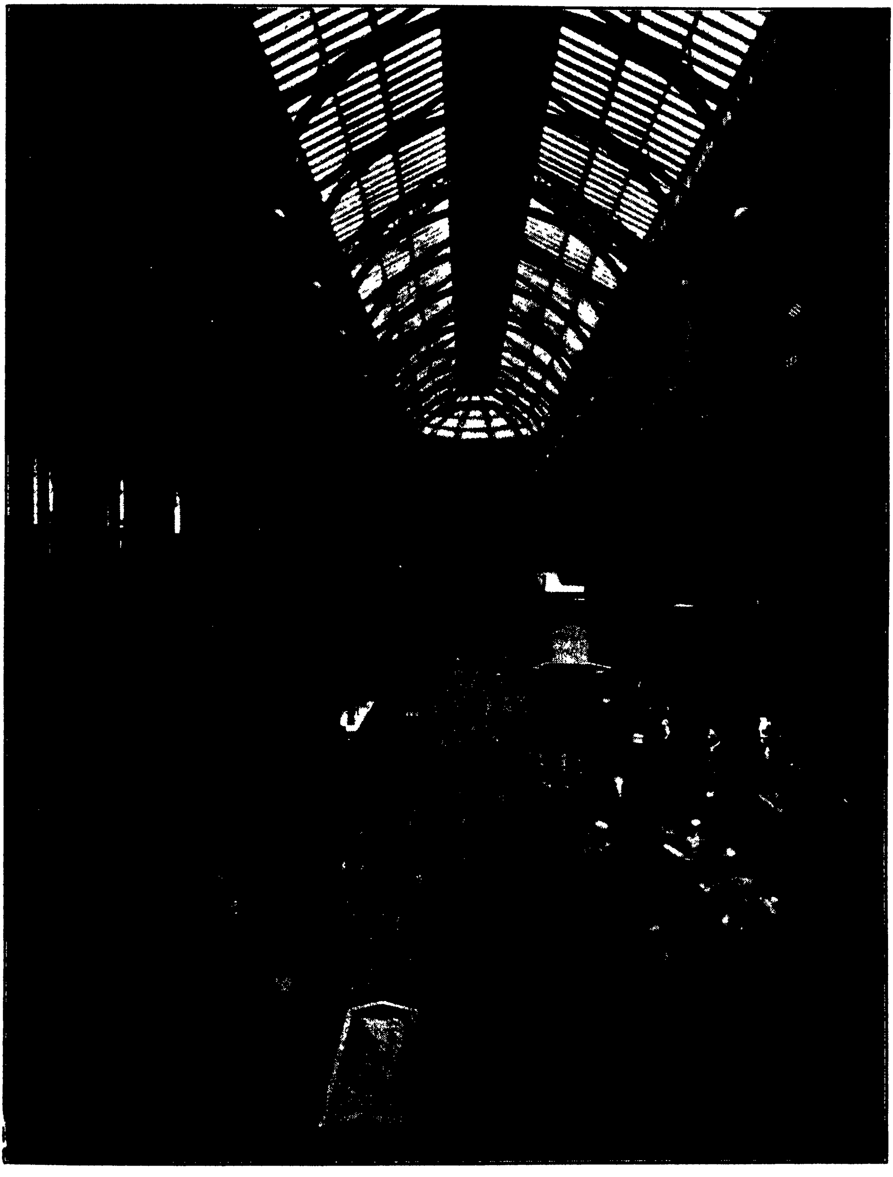


FIG. 3.—ROYAL SCOTTISH MUSEUM. MAIN HALL, LOOKING EAST.

which has been extinct since the year 1880. A fine group of Zebras and an unusually large African Elephant cannot possibly be overlooked, while overhead is suspended (as seen in the photograph) a skeleton, 78 feet in length, of a Sibbald's Rorqual or Blue Whale, stranded at North Berwick in 1831 and dissected by the famous anatomist, Dr. Robert Knox.

It will now be advisable to ascend one of the stairs at the east end of the Main Hall, and upon reaching the first floor a change of subject may be had by entering the large hall in the north-eastern corner, which contains the important Egyptian collections, arranged to illustrate the manners and customs, the religion, and the arts and crafts of the Egyptians from the earliest times to the Coptic period. In the centre of the hall is a fine collection of alabaster, stone, and earthenware vessels, dating from the early prehistoric age to the 30th dynasty (fourth century B.C.). A collection of Babylonian and Assyrian antiquities and a series of cuneiform tablets of clay from Mesopotamia are also on view in this room.

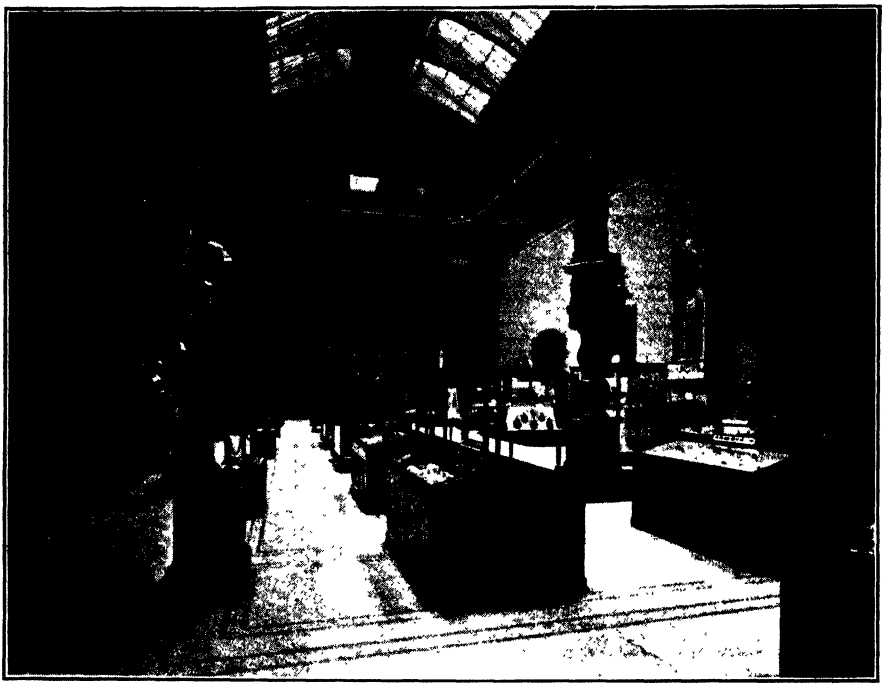


FIG. 4.—ROYAL SCOTTISH MUSEUM. HALL OF EUROPEAN ARMS.

Leaving the Egyptian Hall towards the south a large gallery is next entered, which contains the exhibited collection of Foreign Birds. Here many rarities will be seen, and several examples of extinct Birds, such as the Dodo, represented by bones and a restoration, the Hackled Pigeon of Mauritius, the Solitaire, represented by a skeleton, and so on. The specimens in this gallery are arranged systematically, but in many cases nests are shown with natural surroundings. At the south end of the gallery a door leads into a room reserved for students, who will find there most of the cabinet collections of Birds and Insects, with the exception of such as are, for reasons of space, stored beneath the exhibition-cases in the various galleries.

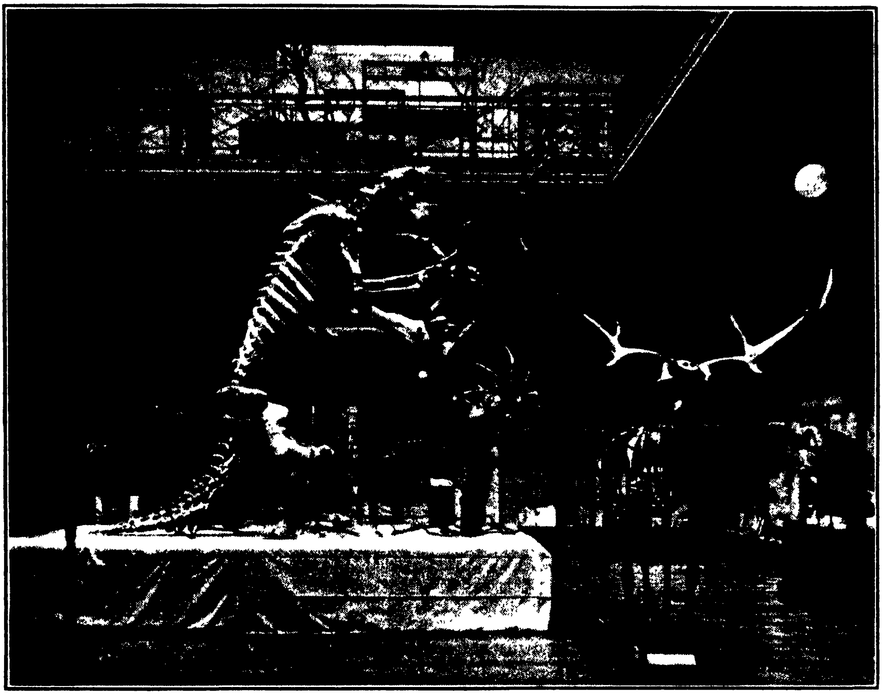


Fig. 5.—Royal Scottish Museum. Extinct Animal Hall.

From the Foreign Bird gallery an opening on the western side leads into a gallery, in which are exhibited most of the Lower Invertebrates, including Protozoa, Sponges, Corals, Echinoderms, Crustacea, and Insects. Adjoining this room is another containing the rest of the Invertebrates, most of the space being occupied by a fine series of Mollusca. The galleries to the south of the two last-mentioned rooms are still in course of preparation, but half of that on the eastern side is already open to the public and contains a series of exhibits illustrating the origin and evolution of Man, and other series, of an elementary character, teaching the broad principles of development and Mendelian inheritance (Fig. 7). The gallery on the western side is being arranged as a Children's room, and is in active preparation. It is hoped that this room, when completed, will be one of the most instructive, for young and old alike, in the Natural History Department.

It is now necessary for the visitor to retrace his steps in order to reach the first-floor gallery of the Main Hall. Here are displayed, on the south side, valuable collections of glass and pottery of all ages and nations. The northern half of this gallery contains silverwork, enamels, ivories, and small specimens of carved woodwork. Running parallel with this part of the gallery is a long corridor, lighted from the street, in which is a fine series of exhibits of Egyptian, Chinese, Japanese, Indian, and Persian Art. This corridor leads, at its western end, into a large hall devoted to Ethnography. Australia, Indonesia, and the Andaman and Nicobar Islands are represented on the western and northern sides, but most of the hall is devoted to the extensive African collection.

The large gallery to the south is given up to the native Art of North and South America and Oceania. After inspecting these fine collections, the visitor proceeds in an easterly direction to enter a smaller gallery containing the Textile collections, and then may climb the stair of the Main Hall to the second floor. In the north-west corner of the building at this level is a large hall containing a very fine collection of Scottish Minerals, and also a Type Collection of Rocks and Rock-forming Minerals, arranged for the benefit of students. In this hall are also displayed several interesting and instructive geological models, illustrating the scenery of various parts of Scotland and elsewhere. The gallery to the south of this hall is occupied by the important collections of Fossils, Rocks, and Maps brought together by the officers of His Majesty's Geological Survey.

Passing eastwards, a gallery devoted to general science for the use of students is entered. Here will be found models of chemical plant, chemical, physical, and meteorological apparatus, and also a series of botanical exhibits. Passing still further eastwards, one enters the large gallery of Comparative Ethnography, where the specimens are arranged according to the nature of their use, and from which one may gain a fine view of the ground floor and its exhibits, since in this section of the building there is no first-floor gallery.

The east wing of the building at this level is largely occupied by the Natural History Department. Commencing with a gallery entered from the Ethnographical gallery just mentioned is a room arranged specially to satisfy the needs of students

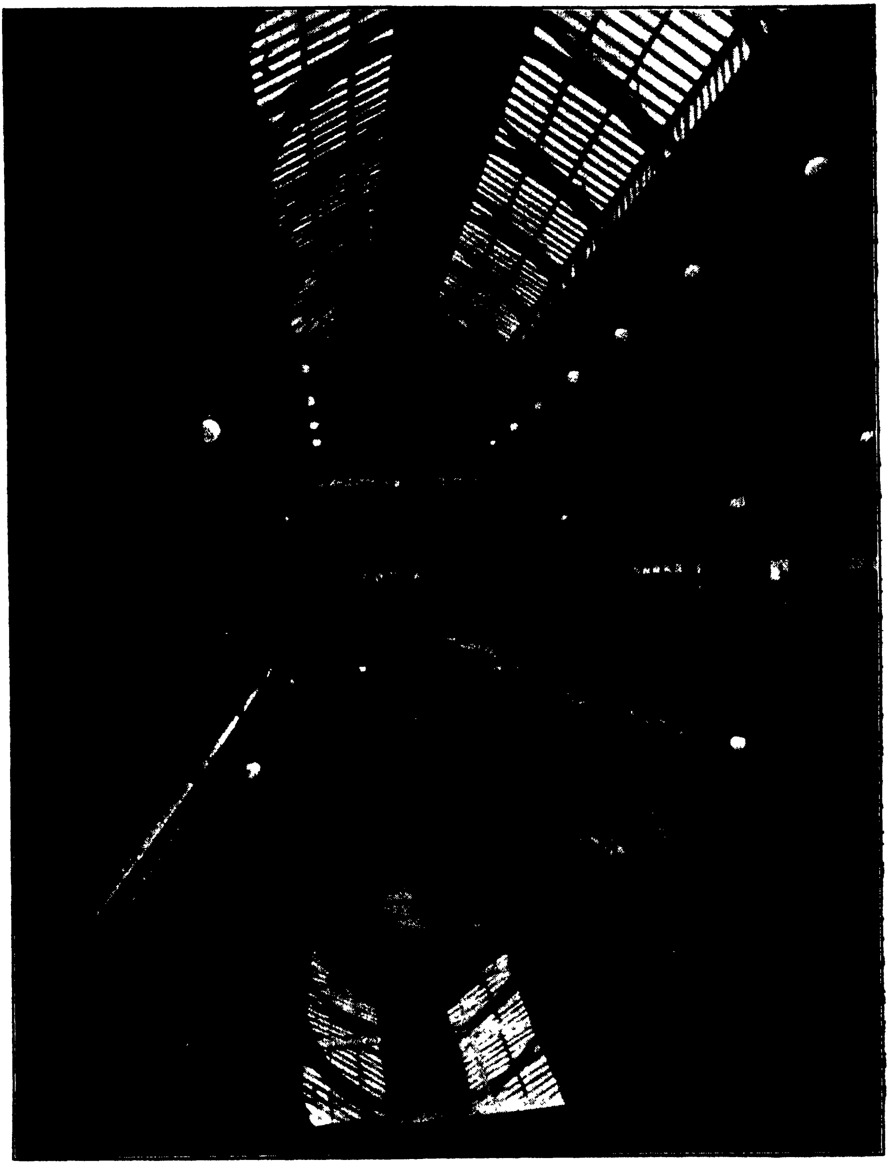


FIG. 6.—ROYAL SCOTTISH MUSEUM. GREAT MAMMAL HALL.

of the general subject of Zoology. Examples and preparations from each group of the animal kingdom are displayed with detailed labels, commencing with the Protozoa and leading on through the various classes up to Man. The desk-cases adjoining the railing contain preparations, illustrating animal topography and descriptive zoological terms. This gallery is of much service to first-year students and to those who are intending to enter the dental profession.

The hall to the south of that last described is devoted to exhibits of interest to Civil Engineers, and contains examples of the Optical Apparatus used in Lighthouses, and models of the various Lighthouses which have been built on the Eddystone Rock and the Bell Rock, etc. Waterworks Engineering is also illustrated by models, and the subject of Bridges is fully dealt with.

Proceeding eastwards two galleries are entered containing the Gubbin and the Robert Dunlop collections of Fossils and a fine representative collection of Minerals of the World, arranged according to the system of Dana.

The extreme east of the building on this floor is occupied by three large rooms belonging to the Natural History Department. The first of these is not yet open to the public, but will eventually contain an extensive Osteological collection, arranged to show the evolution and adaptation of the skeleton of Vertebrates and a series of skeletons of all the higher Scottish animals. The large gallery, which may be entered from the gallery of the Main Hall, contains the exhibited collections of Fishes, Recent and Fossil, while the large room in the north-east corner is entirely devoted to Reptiles. This room has recently been rearranged, and is now much more attractive than formerly.

The visitor may now walk round the gallery of the Main Hall, where he will find a collection of Arms and Armour, Oriental Textiles, and, on the north side, an extensive series illustrating the Arts of Asia. The tour of the second floor of the Museum has now been completed, and a descent should now be made of the stair to the ground floor, where a few rooms at the west end remain to be visited. The largest of these rooms is one containing an instructive series of working models of machines and engines of various kinds. There are also several fine models of Warships and other vessels, Aeroplane exhibits, and so on. Next to this hall on the east is a smaller hall devoted to the subjects of Mining and Metallurgy, and here again will be seen some very instructive models.

The principal collections on exhibition have now been seen, but it must not be forgotten that there is a great wealth of material stored in cabinets, access to which can be obtained by those specially interested, upon application to the staff. In the Natural History Department there are many important collections housed in the various cabinets which are placed either in the Study Room or beneath the desk-cases which are built round the different galleries. The "Dufresne" collection, containing many thousands of specimens of Birds and Insects, was acquired by the University in 1819, and in 1865 transferred to the Museum. In this collection are to be found many type-specimens of Insects, described by Godart and Olivier. An important collection of Birds' skins from the great Tweeddale collection and many other more recent acquisitions of great value are carefully housed in this Museum. The collection

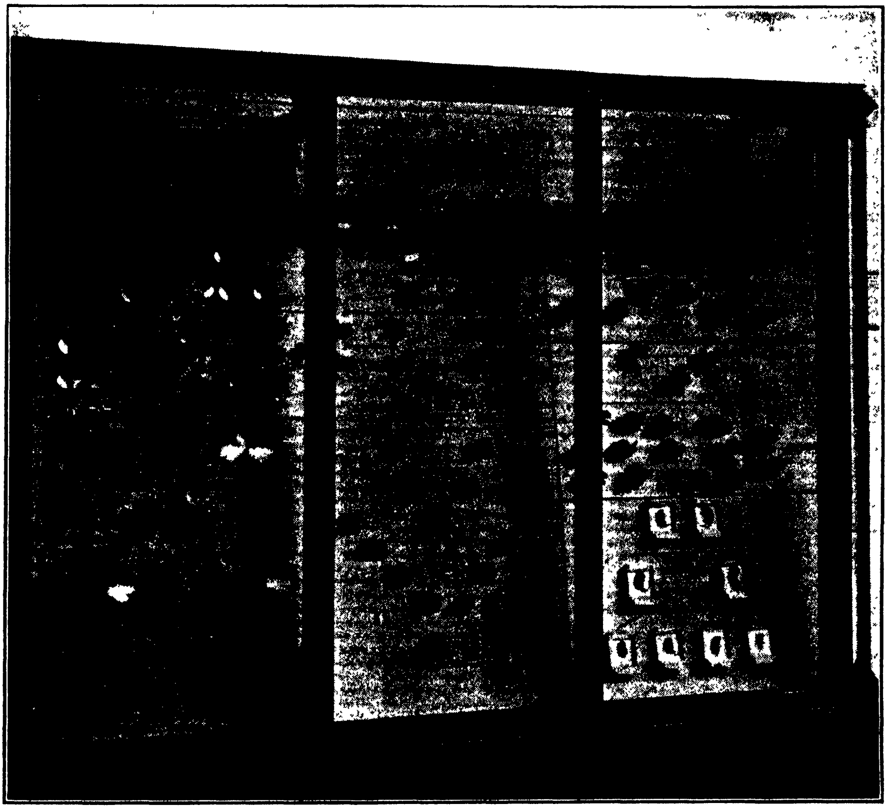


FIG. 7.—ROYAL SCOTTISH MUSEUM. EVOLUTION GALLERY: EXHIBIT ILLUSTRATING PRINCIPLES OF MENDELIAN INHERITANCE.

formed by Hugh Miller, when writing his classical works on the Old Red Sandstone, are on exhibition at the south end of the Fish gallery, and in the same room are to be found, either exhibited or in cabinets, the great collections of Scottish Fossil Fishes, described by Agassiz, Traquair, and, quite recently, Stensio. The cabinet collections of British Birds and of British Insects are also of great importance, containing as they do many rare species and unique specimens, the enumeration of which is impossible in this place. With regard to the exhibition of specimens, modern ideas are in this Museum gradually replacing the older methods of arrangement, which have always tended to tire the visitor. Endeavours are now being made in each Department to make the exhibits tell a story, by the more efficient grouping of the specimens, and by the preparation of informative labels.

Before this account is closed attention should be drawn to the very handsome staircase, which has been recently erected on the south side of the Museum, temporarily for use in case of emergency, but eventually to form a conspicuous feature in the centre of this great Museum when the plans for extension are finally carried out.

A NEW IRISH WOLFHOUND.

By J. Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

A champion Irish Wolfhound, "Lady of Raikeshill," has recently been presented to the Museum by Mrs. William Knox, whose kennels at Raikeshill, Yorkshire, are famous as a centre for this breed.

The new specimen is a fine adult female, which was born in December 1926 and died suddenly in November 1931. It may thus be regarded as having died in the prime of life and is, on this account alone, a very valuable addition to the Collection of Domesticated Animals. In life, she was generally considered to be a most beautiful hound; she had a handsome head and the gentle brown eye of the deerhound, and was tall, measuring about 35 inches at the shoulder, with a long, splendidly shaped back, very deep chest, and well-arched loins.

The Irish Wolfhound, or Wolfdog, as a breed has nearly died out on more than one occasion; at the present time, thanks to the energies of Mrs. Knox and other breeders, it would appear to be in a fairly flourishing condition, and there seems to be little fear of the breed becoming extinct in the near future.

These dogs are of considerable antiquity, since it seems highly probable that the Belgic dogs, used by the Romans in the combats in the arena, were either identical with the Wolfdogs or were their immediate ancestors. The Belgæ undoubtedly imported into Ireland the first specimens of these large dogs. Sir James Warr refers to the Irish Wolfdog in his "Antiquities of Ireland," and quotes from an epistle by Symmachus to his brother Flavonius, in which reference is made to some 'Canes Scotici' having been shown at the Circensian Games, "to the great astonishment of the people, who could not judge it possible to bring them to Rome otherwise than in iron cages." In the time of Symmachus, that is towards the

Irish Wolfhound "Lady of Raikeshill."

latter end of the fourth century, Ireland was known by the name 'Scotia,' and it seems more probable that the dogs referred to in this letter were Irish Wolfdogs rather than British Mastiffs. The latter, as Warr points out, would not have caused "great astonishment" when exhibited at the circus, as the breed was well known.

The Wolfdogs of Ireland were probably introduced into Scotland at a very early date and were there used more for hunting deer than as wolfdogs, and thus became known as 'Deerhounds.' It seems almost certain that the Highland Deerhound and the Irish Wolfhound were originally one and the same breed. Both dogs appear to have diminished in stature since these early days, the Scottish breed more so than the Irish one. As the number of wolves decreased in Ireland so the wolfdogs got less popular and, had it not been for a few enthusiasts, the breed would have disappeared about the same time as the wolf became extinct, that is about the year 1766.

MRS. KNOX WITH A GROUP OF WOLFHOUNDS.

When the breed was in very low water in the early part of the nineteenth century, the Irish Wolfhound Club was formed and did much good work to help in perpetuating it.

One of the Club's activities was the publication of a small book entitled "The Irish Wolfhound," by Captain G. A. Graham, which was published in 1885, and helped to stimulate breeders in Great Britain and Ireland.

This new specimen has been very finely set up in the Rowland Ward studios and is now on exhibition in the North Hall. In addition to the photograph of "Lady of Raikeshill's" head, taken from the living animal, there is also reproduced as an illustration to this article a group of Mrs. Knox's Irish Wolfhounds, including "Lady of Raikeshill," at exercise with their owner.

BEHIND THE SCENES IN THE MUSEUM. I.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

There are few public institutions whose aims and functions are so vaguely understood by the general public as are those of museums; and the reason for this must lie mainly with the museums themselves, for, since the first museum was founded nearly twenty-three hundred years ago, all manner of buildings, containing all kinds of objects, have performed various functions, or often no function at all, under the name of museum.

The word museum originally meant temple of the Muses, and later came to be applied to a place devoted to the works of the Muses. The first museum of which we have any record was that founded by Ptolemy Soter in Alexandria towards the close of the fourth century B.C. This institution, indeed, lived up to its title, for it was adjacent to and connected with the Temple of the Muses, and it maintained, at the expense of the State, a band of students whose undivided task was the advance of knowledge.

Throughout the Dark Ages there is no record of museums, but in the Middle Ages, with the revival of learning, the name came to mean the collections of miscellaneous objects—whether antiquities or specimens of natural history, paintings or sculpture—often found in the studies of scholars or in the halls of the wealthy.

In these early forms of museum there was, however, no suggestion of public exhibition, and the idea of collections for the instruction or amusement of the general public is less than two hundred years old. In fact, it is only within the last sixty years that museums in our sense of the term have become at all common. Unfortunately, no common aim dictated the policy of these numerous and varied institutions, and much of what unpopularity is attached to the museum idea descends from the less successful of these collections. Even to-day some exist, and to many people the word museum unhappily conjures up the vision of a dusty and often dilapidated building, whose musty rooms contain serried ranks of stuffed birds with unreadable labels, piles of "stones" labelled "Geological Specimens," and other curious objects, whose only claim for inclusion in a museum would appear to be their complete unsuitability for anywhere else.

Fortunately, the position has greatly improved, and even in the small provincial towns excellent museums now exist; but the old prejudices linger, and the purpose of the magnificent collections in the national institutions is not always clear to the visitor. Of course, there are many kinds of visitors, ranging from the man who seeks the comfortable and free shelter of the warm building to forecast the winner of the two-thirty to the distinguished scientist who comes to study some abstruse problem: and there are several lines of policy. "The first function of a Museum," wrote Ruskin, "is to give example of perfect order and perfect elegance, in the true sense of that test word, to the disorderly and rude populace," and, no doubt, many are attracted by splendid buildings and pleasing interiors, which are what Ruskin really specified. Many more come to museums to see curiosities; to such a two-headed sheep or an immense skeleton is an irresistible attraction. Forty-two years ago it was said of the British public by a prominent museum official, that "it is almost impossible, by any means short of fireworks, to attract their attention to fossils less than a yard in diameter." The same statement is almost as applicable to-day.

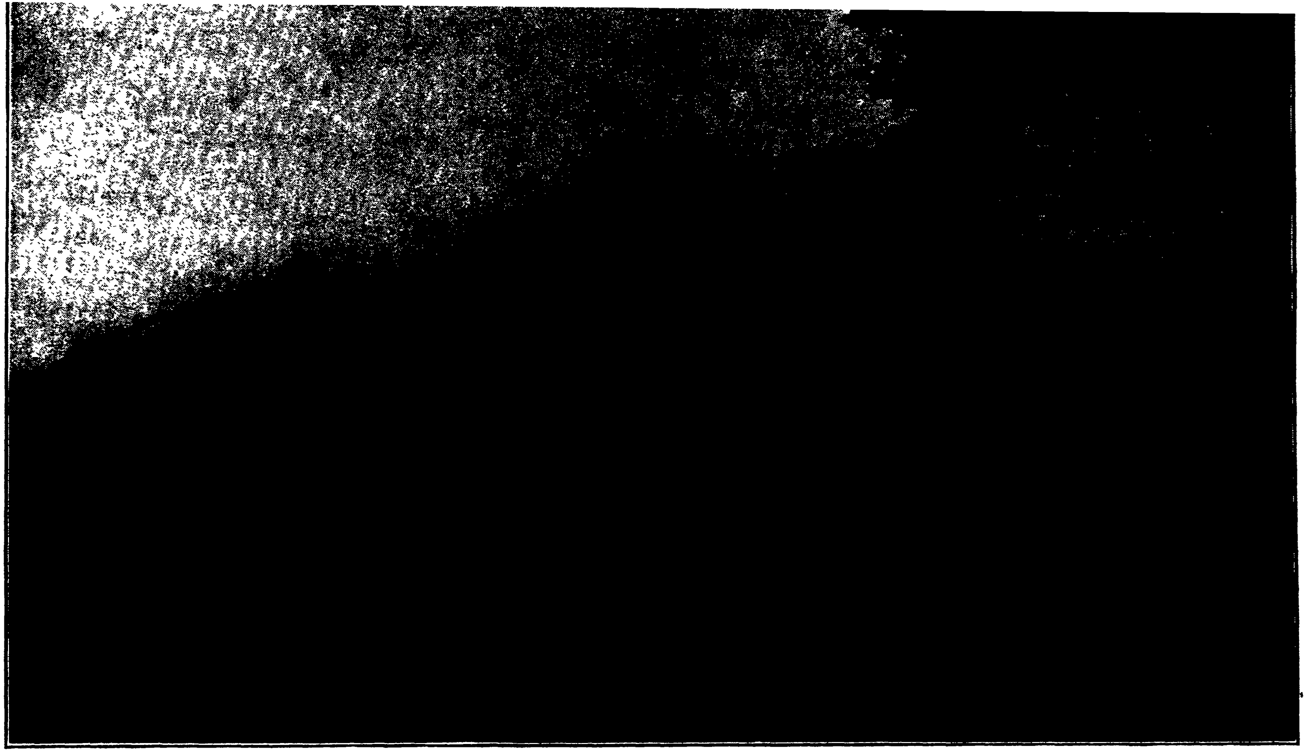
The function of the Natural History Museum has been defined as twofold: (1) the *diffusion* of scientific knowledge, and (2) the *advancement* of the same. In accordance with this view, the collections are of two kinds: firstly, an exhibited portion which all may see; and secondly, a reserve series, kept in drawers and private rooms, for consultation by accredited students.

The general public therefore is familiar only with the large series of exhibited specimens. As one's knowledge is, so one's reaction to this series will be. Some visitors wander round the galleries, vaguely passing the time and viewing the collections with an ununderstanding wonderment equal to that felt on looking through a mediaeval manuscript: to others the collections have glimpses of intelligibility, but mainly seem to be

Photograph by courtesy of Marius Maxwell.

STUDY OF EAST AFRICAN ELEPHANT IN ATTITUDE OF ALARM AND SUSPICION.

The head is elevated, the tusks thrust forward, and the ears widely spread. Immediately before an animal charges the trunk is frequently thrown aloft and is then curled tightly up during the actual charge.



Photograph by courtesy of Marius Maxwell.

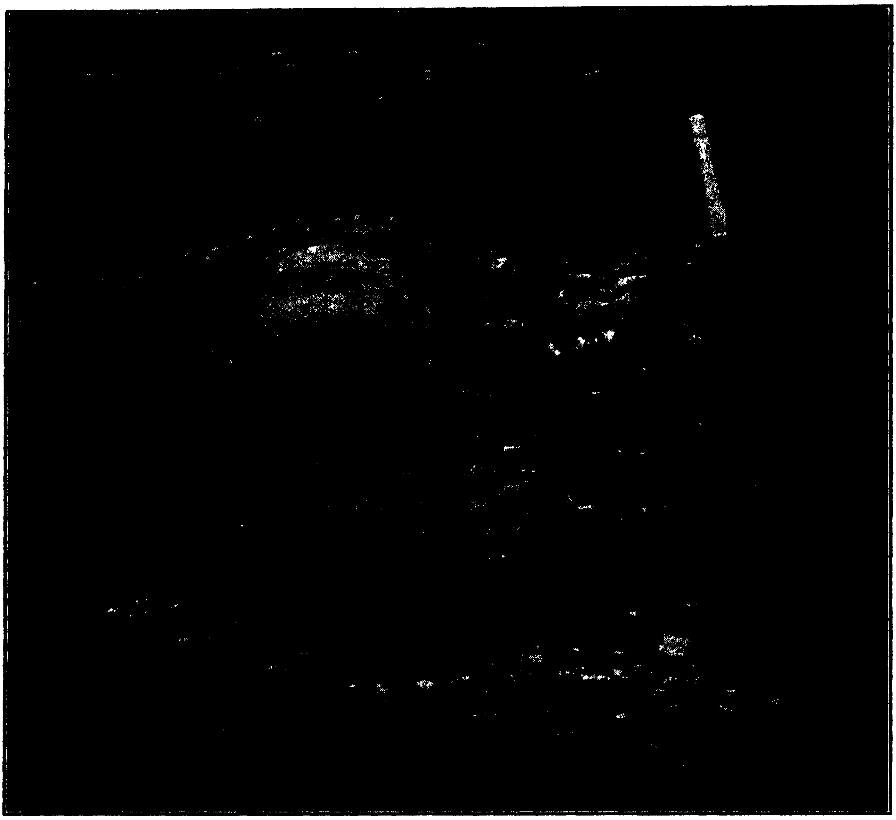
A FAMILY PARTY OF EAST AFRICAN ELEPHANTS.

Cow elephants are sometimes found accompanied by two or three calves of different ages. In the case of two calves there is usually a difference of from three to five years in their ages. When three young ones are present the oldest of them would be a sub-adult specimen. In Africa, a female elephant probably begins to breed when twenty years old; a bull elephant is considered to be at its prime at the age of fifty.

Photograph by courtesy of Marius Maxwell

A Charge of African Elephants in the Lorian Swamp, Northern Frontier Province of Kenya Colony.

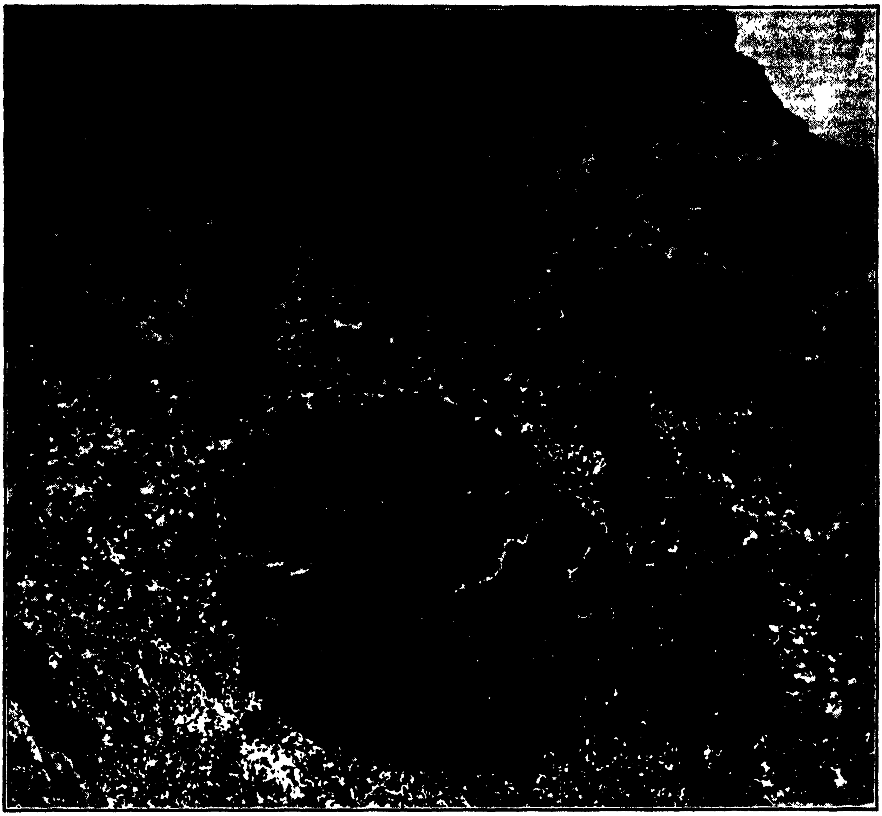
The elephants advanced in a V-shaped formation, with the bulls on the flanks and a vicious cow with calf in the centre. The cow elephant left its calf and came up at a rapid amble into line with the leading bulls, its head thrust forward and its tusks levelled at its opponents. At such a time it became necessary to fire, and to fire to kill, as the range was too short for anything else. The female elephant was accordingly shot and, taking advantage of the consternation caused by the report of the rifle, in order to avoid further destruction, the photographer and his friend then sought cover. From here they observed the bewildered animals form a cluster around



Photograph by T. W. Reeder.

LIMESTONE NODULE IN BEDDED MARL.
Charmouth, Dorset.

The spherical nodule is formed of hard limestone, in which bedding planes are apparent. This shows that limy matter from the surrounding marl segregated at this spot and impregnated the marl. As the nodule grew, the surrounding bedded marl was pushed apart, and the bedding planes are seen to bend round so as to enwrap the nodule. Moreover, the nodule is seen to lie in a string of "beef," that is, fibrous calcium carbonate showing "cone-in-cone" structure. Beef also is a secondary deposit, which has segregated along the bedding. A beef-seam is generally double, each half parted by a film of crumbly marl. The nodule in the photograph is seen to lie in the main parting of a thick beef-seam, the beef forming a jacket enwrapping the nodule. The coarse cone-in-cone structure of the beef is well shown above the nodule on the left, and below it on the right. The geological age is Lower Lias.



Photograph by H. G. Herring.

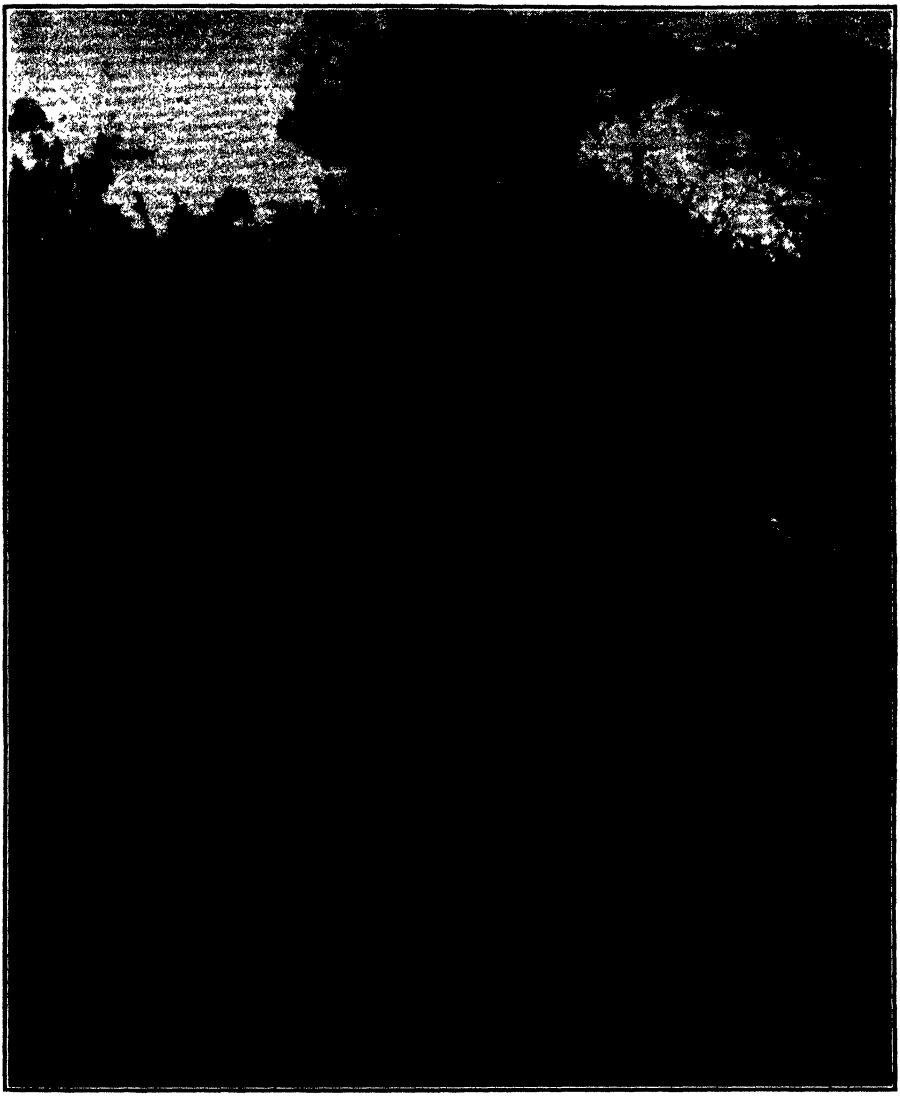
ORBICULAR DIORITE.
Roselle Point, Alderney.

Part of a polished specimen recently collected for the Museum by Dr. A. E. Mourant from Roselle Point on the north coast of Alderney. These remarkable spherical bodies in the diorite are something like the surrounding rock in composition, but the light and dark minerals (felspar and hornblende) tend to separate into alternate light and dark layers. This structure is the result of reaction between the originally molten rock and inclusions of an older more basic rock (gabbro). Relics of these inclusions survive in some of the spherules as nuclei. The largest orbicule in this picture measures five inches along its greatest diameter.

Photograph by courtesy of Marius Maxwell.

MASTER BULL OF A HERD OF ELEPHANTS, WHICH HAS ASSUMED A CHALLENGING ATTITUDE.

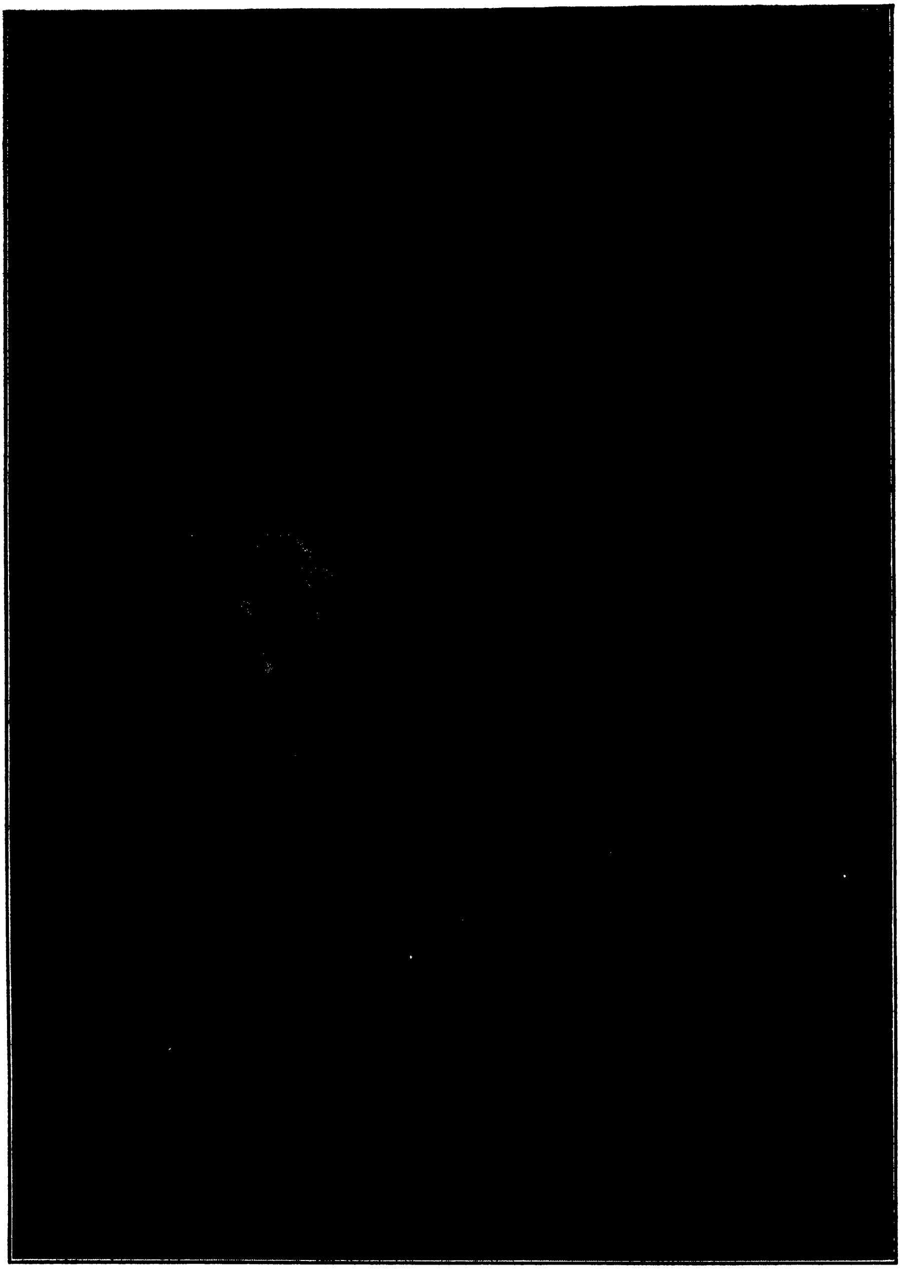
Other elephants of the herd became alarmed and in a few minutes a general state of panic and confusion ensued. Elephants burst out from all sides of the bush to join their companions in the open and gave the photographer a very uneasy few minutes. However, after a noisy demonstration, the leaders of the herd turned about and led the entire party back into the bush, and the photographer also beat a retreat—but in the opposite direction.



Photograph by courtesy of Marius Maxwell.

AN ELEPHANT ALMOST HIDDEN BY THE BUSH, THE WHITE TUSKS ALONE BETRAYING ITS POSITION.

The animal is standing motionless and alert, listening for the slightest sound. It has got wind of its pursuer and become suspicious of danger.



Photograph by courtesy of Marius Maxwell.

A GROUP OF HIPPOPOTAMI ENCOUNTERED IN THE REGION OF THE NORTHERN GUASO NYIRO.

They were unable to reach the river owing to a thick hedge of thorn bush behind them. They began trotting restlessly up and down in front of the camera. Then, taking things more easily, one of them actually sat down on its haunches like a great pig. The squatting hippopotamus regarded the photographic operations with waning interest, and finally through sheer apathy and indifference lay down.

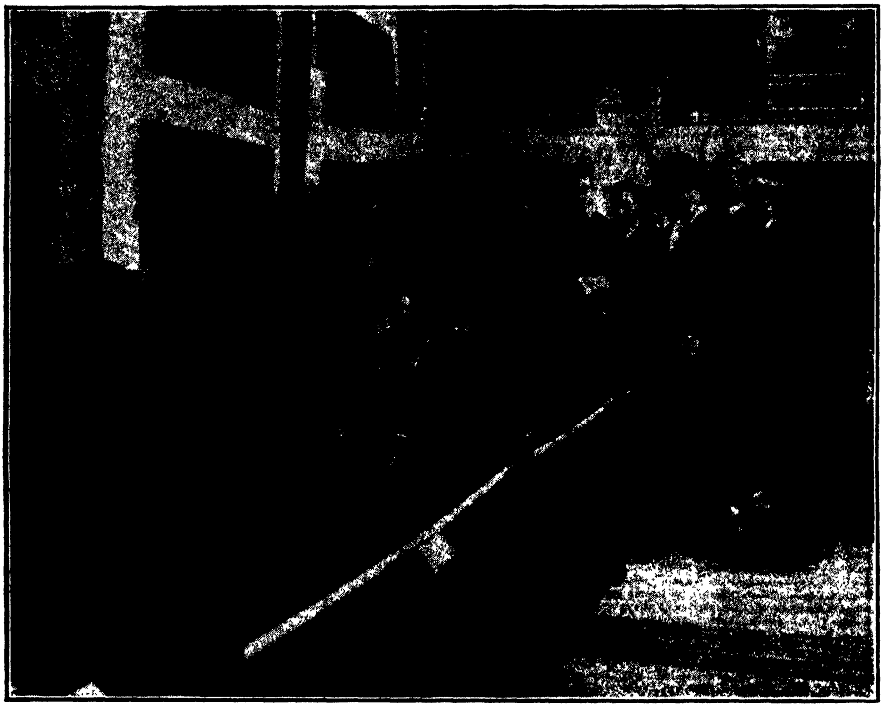
unrelated to every-day life. To some, again, the Zoological Department is "the stuffed Zoo"; to others the Geological Department contains improbable relics of a time now, happily, past, but kept in green memory by a number of individuals who would otherwise be unemployed.

Fortunately, to most visitors the exhibited specimens are veritable illustrations from the book of life, and a welcome relief from the drab features of every-day existence. Even such intelligent and appreciative visitors do not always understand the Museum's function. To a member of the Staff the query is not uncommon: "But what do you do? The cases are full of specimens and the galleries are full of cases. What is there left to do?" Beyond the necessity of keeping the building clean and guarding its contents little seems to be called for.

Yet all the gallery space is the least of the Museum's work. The galleries are the Museum's shop windows, and, although few persons would think of shop windows as the whole shop, it is commonly assumed that exhibition galleries are all of a museum. Behind the scenes in the Natural History Museum is as busy an organization as in any departmental store. Many branches of science and art, including engineering and medicine, wait upon the researches carried out there. A mistake in identification in a zoological laboratory here may mean lives lost in Africa or ruin to a furniture dealer. This work, too, is all in addition to that necessary to keep the exhibition galleries in order. Days of work lie between the catching of a butterfly in a meadow and the specimen's appearance in the gallery, and months, even years, of work may elapse in the preparation of a single fossil mammal or reptile. What, then, is the work of the Museum Staff, and to what useful end does it contribute?

From the public point of view the Natural History Museum is an unusually large building, with a great amount of its space devoted to the exhibition of natural objects. The actual floor space so used, at the moment, is approximately 200,000 square feet, or almost exactly 4½ acres. The number of specimens before the public in this space cannot well be computed, but amounts to several millions, while their value is also inestimable, as many of the specimens are irreplaceable and priceless. The average number of visitors who view these collections in a year is 550,000, and of that number nearly 100,000 come to the Museum on Sunday afternoons.

It requires little imagination therefore to realize that the maintenance and warding of the exhibition galleries is a task of some magnitude. A staff of thirty-eight is required for warding the premises, inside and out, and one of twenty-nine for cleaning the galleries and cases, but the latter staff has, of course, additional duties to perform. It may be of interest to mention that, contrary to the general practice, the cleaning of the galleries is done in the morning, so that the public are admitted into freshly aired and cleaned galleries. For the safety of the public a first-aid station is maintained, while several members of the staff are qualified doctors. The danger of fire is naturally keenly appreciated; naked lights and smoking are strictly prohibited in the Museum, and an adequate staff of firemen is always on duty.



Photograph reproduced by permission of Keystone View Company, Inc.

The Official Guide Lecturer conducting a public tour in the Exhibition of Game Animals of the Empire.

The actual description of the galleries and the specimens cannot be given here, but each exhibit is labelled so as to make it intelligible to the public. It should also be stressed that all the specimens in the Museum are not in the galleries, and that those specimens which are on view are intended to convey information, and not merely to fill up available space; space is all too limited. Visitors or students who desire to understand more of the Museum's contents can obtain information of a general or detailed character from the numerous guides and catalogues published by the Trustees. These books enjoy a wide popularity and many of them are used by students in universities and colleges throughout this and other countries. These publications, together with a very large and varied series of post-cards, both plain and coloured, can be purchased at the Museum bookstall in the Central Hall. A complete list of these can be obtained, post free, on application to the Director.

A less laborious method of obtaining information about the collections is supplied by the Guide Lecturer, who takes two tours, one in the morning and one in the afternoon, each lasting for an hour, every day of the year except Sundays, Christmas Day and Good Friday. These tours are free and are attended by approximately 14,000 persons every year. All the galleries are dealt with in the course of a week, and an excellent opportunity is thus afforded every visitor of obtaining first-hand information about the exhibits. Private parties can be given special tours by arrangement, and the tours mentioned do not include the great amount of work which the Guide Lecturer does for schools and children's societies. Essentially the Guide Lecturer is the liaison officer between the public and the Scientific Staff. A course of more specialized lectures, given by members of the staff on Monday mornings, has recently been inaugurated, and has proved to be popular.

Many additional services are rendered to the general public by the Museum office and libraries, but these activities will be dealt with later.

The establishment of the British Museum marked the revival of the Ptolemaic conception of museums. Here again, at the expense of the State, research workers are maintained to advance knowledge; but the British Museum goes further, for the public are also directly catered for. This public service, second to none in the museum world, is obtainable on every day of the year except two. It is a willing service, never complaining of overwork, but always searching to extend itself and for fresh fields of endeavour. The Museum is literally the gateway of knowledge and its motto might well be: "Knock, and it shall be opened unto you."

A NATURALIST'S VISIT TO THE PARC NATIONAL ALBERT, BELGIAN CONGO.

By The Hon. M. Hachisuka.

On the bed of the Great Rift Valley, where Uganda meets the Belgian Congo, exist numerous large and small lakes, together with semi-arid plains and high mountains. This region is not well known, but those who have occasion to pass through it are delighted with the pleasing diversity of scenery that encounters the eye. Because of this diversity the region is often known as African-Swiss.

In 1929, under the auspices of King Albert of Belgium, the Government established the large nature reserve known as the Parc National Albert.* Since then several expeditions have been sent there to improve the organization of the Park with a view to making the region of easier access to travellers, and, at the same time, to collect scientific material. The last expedition was organized early in 1931, under the leadership of Dr. J. M. Derscheid, the Administrator of the Park. I accompanied the expedition as a naturalist, and our party, consisting of seven members, travelled in two motor-cars, arriving at the Park in February.

After our landing at Mombasa, the journey through Kenya and Uganda was a comparatively easy one. We travelled in moderate comfort, though some roads were a heavy trial to our safari cars; while we often experienced a lack of daily provisions at the camps and rest-houses on the way.

We entered Congo territory from Kabale, the last administrative post in Uganda, where we camped on the shores of Lake Bunyoni. I mention this locality as its faunal region is the same as that of the Parc National Albert. Dr. E. B. Worthington,† who was also exploring in East Africa in 1931, has published an interesting account of this region, and students are advised to consult his paper.

The beautiful Lake Bunyoni is covered with blue water-lilies, over the leaves of which, black rail (*Lymnocorax niger*), with yellow bills and large red legs, hop skilfully about. A flock of sacred ibis (*Threskiornis aethiopicus*), pleased our eyes, and the carrion-eating white-necked ravens (*Corvultur albicollis*) came within a few yards of our tent, searching fearlessly for food. The skin of a leopard killed locally showed that it belonged to the East African type.

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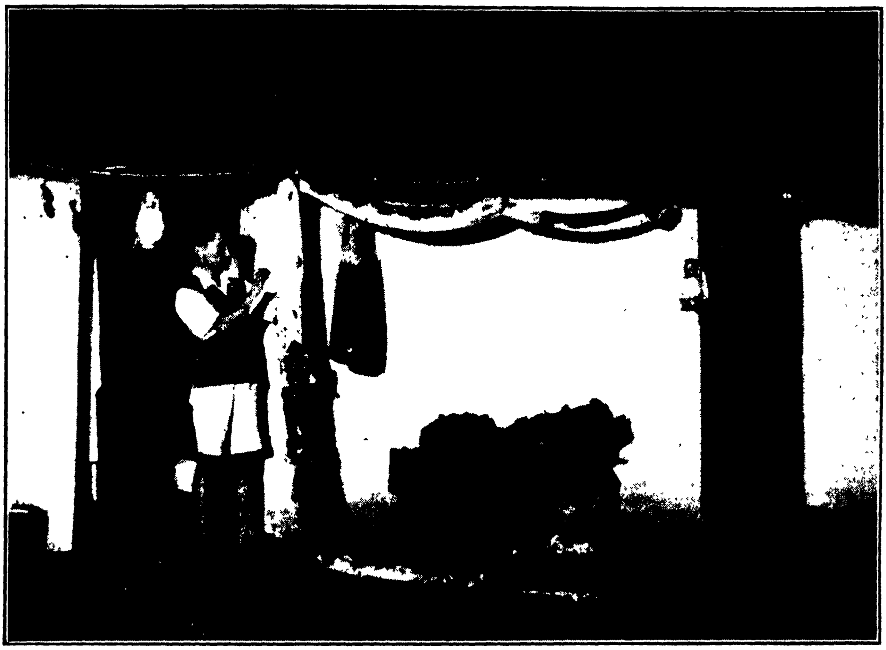
* In his interesting paper, "Proposed British National Parks for Africa," *Geog. Jour.*, 1931, vol. 77, pp. 401–422, Major R. W. G. Hingston refers to the Parc National Albert and suggests that the extreme south-west portion of Uganda adjoining it should be constituted the Gorilla National Park (*loc. cit.*, p. 416).

† E. B. Worthington, "The Lakes of Kenya and Uganda," *Geog. Jour.*, 1932, vol. 79, pp. 275–293.

Three days' march took us to the headquarters of the Park at Rutshuru, while the cars were sent there via Lake Tanganyika to traverse Lake Kivu. The sun was strong, although the altitude is 3800 feet. We found no mosquitoes, but tsetse flies are numerous locally along the Rutshuru river and the shores of Lake Edward. The Ruanda * tribes graze their Ankole cattle on the plain. The horns of these beasts are magnificent and are said to be the largest of their kind in the world.



THE HON. M. HACHISUKA SKINNING A LARGE PYTHON CAUGHT IN THE JUNGLE AT RUTSHURU.

The Parc National Albert is divided into two parts : the one is in the north, an area of about 300,000 acres in the vast plains adjoining Lake Edward, and the other is the volcanic region rising from the shore of Lake Kivu. The water-mark of the latter is calculated to be 4380 feet. The mountain range is called "Birunga," and includes eight prominent peaks (two active and six extinct volcanic cones), namely: Nyamuragira, Nyiragongo, Karisimbi, Mikeno, Bishoke, Mugahinga, Sebyinyo, and Muhavura. It is a most gorgeous sight to behold their snow-capped peaks from Rutshuru, and the smoky glow proceeding from their craters by night forms a spectacle which is both magnificent and strange. Tinged with iridescent colours by the rising and setting sun, umbered by drifting cloud shadows, these ancient peaks present a panorama which can never fade from memory. Storms in this region easily spring up, and the wind frequently reaches a velocity of fifty miles an hour. Very often our tent poles failed to stand the strain. For aviators flying from Cairo by the South African hydroplane route, this part of the continent would be difficult of negotiation. Sir Alan Cobham tells me that, judging by his experience in 1931, it will be exceedingly difficult to fly across this mountain range from Lake Edward to Kivu.

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* See J. B. Laws, "A Minor Adjustment in the Boundary between Tanganyika Territory and Ruanda," *Geog. Jour.*, 1932, vol. 80, pp. 244–249.

ANKOLE CATTLE IN THE GRAZING COUNTRY NORTH OF LAKE KIVU.

The horns are of gigantic size and are said to be the finest of the kind in the world.

Soon after our arrival at Rutshuru we had the honour of welcoming Prince Eugène de Ligne, at that time President of the Park Commission. His Highness motored through the Sahara in four days between Algiers and Goa. The Princess, who had chosen an easier way by flying from Cairo to Juba, took about the same time. At Rutshuru we got together a food supply for several weeks and engaged fifty to a hundred Bantu porters, together with the necessary blankets for their use, and were ready for the ascent to the volcanoes.

This southern reserve is best known to naturalists as the home of the mountain gorillas (*Gorilla gorilla beringeri*), the largest of their kind. Their less hairy relatives are represented in West Africa and other lower mountains in the Congo. The few sportsmen acquainted with these animals regard them as trophies on a par with lions and buffaloes. Several herds of from twelve to thirty ngagi, as the gorilla is called by natives, may be encountered along the saddle between Mt. Karisimbi and Mt. Mikeno.

We made our collecting centre at Rueru, at an altitude of 9000 feet, just above the bamboo zone. It was here that in 1921 Count Gyldenstolpe, the naturalist attached to the Swedish Expedition led by H.R.H. Prince Wilhelm, also made an ornithological collection. As our porters already began to suffer from cold, we sent most of them down to the village. The only amphibian discovered was a small frog, *Phrynobatrachus graueri*, hitherto unrepresented in the British Museum collection. We found a chameleon, *Chameleon biteniatus graueri*, on mossy branches. It is amazing how a tropical animal can adapt itself to these surroundings. This is also a mountain species newly added to the Museum collection.

GIANT SENECIO AT RUKUMI (11,500 FEET).
The slope of Mount Mikeno is visible in the background.

At the request of the Trustees of the British Museum a hunt was made for a gorilla's nest. The animal makes its track along the jungle, wide enough for a man to pass along. Sometimes, however, the track is not opened up overhead, but consists of a tunnel through the undergrowth. By following this, one eventually arrives at a bamboo grove, where the ground is fairly well cleared. Big bamboos are bent into a circle forming a platform about seven feet high. Branches and leaves, crushed and beaten flat, are bedded on top, the whole forming a comfortable springy mattress, which we found to be strong enough to bear the weight of four men. This particularly fine nest was probably intended for the head of the gorilla family, for smaller, more crudely made, nests were scattered all over the place. One can easily imagine how a colony of gorillas live in the middle of a bamboo forest, well sheltered from the wind. A labyrinthine maze of tunnels radiating in all directions through the jungle gives access to their settlements. While protected by armed guards, I ordered my men to cut out the top part of a nest. It was then carried by four natives along a gorilla track which previously had to be widened in order to permit of unobstructed passage. In this manner we finally got it down to the bottom of the valley.

It has been said that the roaming habits of the gorilla will not permit of its occupying a nest for more than a night, but this statement is hardly justified by the fine craftsmanship displayed in the nests found. Several days must have been occupied in their construction.

Lobelia and Giant Heather on Mount Mikeno (12,000 feet).

A second type of nest was found in a lobelia forest. We did not collect one of these as the lobelia is really a herb, and the fresh green nests found on the ground would not have remained in the same condition when sent to England. A third type was found on the branch of a hagenia tree. Though this tree grows to an immense size, it has few branches equal to supporting the weight of a giant ape. On one tree two nests were discovered, but they were of a smaller type, being only about six feet in diameter. Situated about thirty feet above the ground, they were constructed of hagenia branches, and their style rather put me in mind of pigeon nests at home.

Several days were spent in getting the nest away. The tree had to be cut down and the nest encased in a huge ball of grass and soft branches, lashed together with vines and creepers. Without this protective covering it would have suffered serious damage. The moss, lichens, and ferns growing on the tree were carefully preserved.

Altogether I examined about fifty nests, two of which were built on trees. The hagenia tree nest reached South Kensington safely, and, when the gorilla group in the Museum is constructed, it will give a good idea of this ape's habitat.

Mr. Marius Maxwell * has given a full and detailed description of the gorilla country, to which vividness is added by a number of illustrations, one of them showing the "night shelter" of a family of gorillas. I came across numbers of these places along the mountain slopes, particularly at the steeper points, but saw no trace of gorillas there. These shelters are of natural formation, and as such do not seem to appeal to gorillas, though they are used as hiding-places by some other animals.

Among the smaller mammals, hyrax were common, and two species of squirrel were by no means scarce. One of the latter is probably new. The specimens were presented to the Museum.

Second Type of Gorilla Nest, in a Lobelia Forest.

As regards birds, the bamboo forest is the home of a rare francolin (*Francolinus nobilis*), only known from the Birunga volcanoes and called ishoke by the Ruanda natives. We heard its call note and saw the imprint of its feet on the soft mud after rain, but not more than a few times did we actually see the bird itself shyly running through the undergrowth. As the region it frequents is quite uninhabited, natives know very little of its ways. Beautiful mountain touracoes (*Ruwenzornis johnstoni kivuensis*), with green plumage and soft crest, boldly flew over the valley, their leisurely flapping wings being ornamented with a flaming crimson patch. Very many interesting mountain birds were seen and collected. Among them may be pointed out a species of weaver bird, *Cryptospiza shelleyi.* This species was made known from the Birunga by Count Gyldenstolpe, who secured one specimen. As soon as I had familiarized myself with its song and movements in the morning and evening, I secured a good series of them.

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* Marius Maxwell, " The Home of the Eastern Gorilla," *Jour. Bombay Nat. Hist. Soc.*, 1928, pp. 436–449.

Gorilla Nest in a Tree.

Few trees are large enough to bear the weight of an adult.

Our next camp was at Kabara swamp, 1000 feet higher than Rueru. It may be recalled that Carl Akely, the collector for the American Museum of Natural History, met with an untimely death here in 1926, when he was working for the establishment of the Albert National Park. At this point hagenia trees were very abundant, while lobelia grew to the height of telegraph poles. The humid mountain mist made our camp very uncomfortable, while the natives were threatened by the nightly visits of leopards.

A leopard skin obtained here opened up an interesting question. One secured in the Birunga Range at an altitude of 6000 feet, when studied by Mr. R. I. Pocock,* was proved to belong to a special mountain race, *Panthera pardus ruwenzorii*, confined to the range and to Ruwenzori. It is characterized by its thick fur and dark markings, and is by no means distantly related to the race found on the high plateau of Abyssinia. The specimen, which I presented, is the first of the race to be added to the Museum Collection.

Nest of an Egyptian Goose at Rukumi (11,000 feet).

This is the highest altitude for a nest known in Africa.

At the height of 12,000 feet lions were by no means rare during our visit, and we found a buffalo freshly killed by them. The buffaloes of these mountains have never been studied so far, and it is likely they will be of especial interest to students of this Alpine fauna. The few specimens which I examined were black in colour, both adult and calf. Adults are of a large size, like the animals of the plains, but the horns are peculiarly small and the fur is quite three inches long. The thickness of the fur differs according to the altitude, that of the animal from the high region being quite long, as already stated. The fur of specimens from the shore of Lake Kivu, however, is very thin and indistinguishable from that of the inhabitants of the plains. So far as I am aware, the scientific name applicable is *Bubalus caffer matthewsi*, but the type locality is Kivu, the type being the lowland animal; the thick-coated animal will probably require a new name.

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* R. I. Pocock, F.R.S., F.Z.S., "The Leopards of Africa," *Proc. Zool. Soc. London*, 1932, pp. 543–591. The author's specimen is described on p. 569 and figured on plate iii.

Rukumi Plateau (11,000 feet) on the Slope of Mount Mikeno.

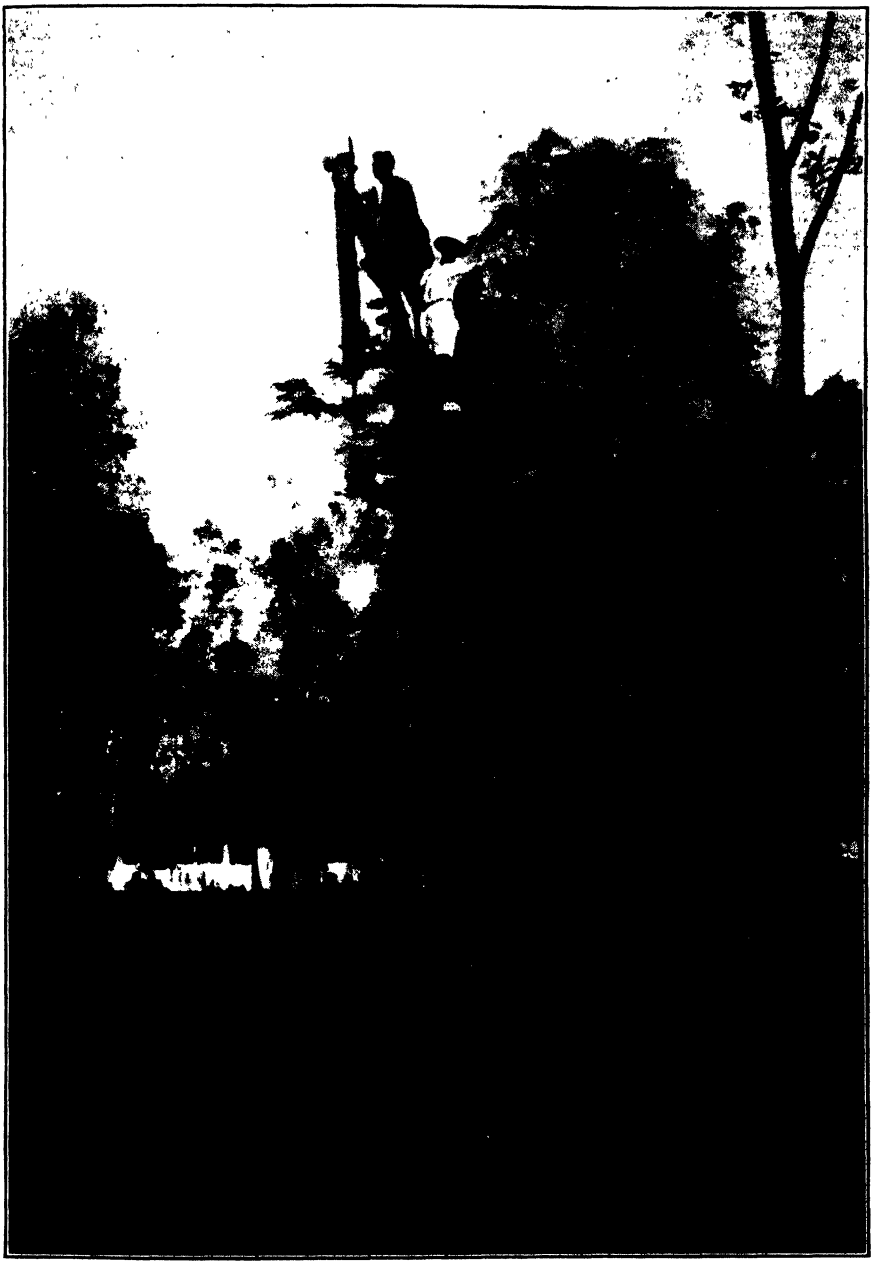
The buffalo in the foreground was killed by a lion. The vegetation seen includes Giant Heather, Senecio tree, and Ruwenzori Carex.

When the trip to the volcanoes was completed, we investigated the northern Park, which lies on the south shore of Lake Edward. This lake has not been visited very much as yet, but it is a perfect paradise for pelicans, snake-birds, goliath herons, egrets, hagedash ibis, marabou storks, hammerhead, white-headed eagle, and geese of various kinds. It is estimated this reserve contains from 2000 to 3000 buffaloes, 4000 to 5000 hippopotami, 200 to 300 lions, 200 elephants, and from 80,000 to 100,000 antelopes (including topi, Uganda cob, reedbuck, waterbuck, bushbuck and duiker). Incidentally, I may mention that the hippopotami here are so tame that they hardly make way for canoes to pass. Fish abound in the lake. Most of these are cichlides, but there are also cyprinides and many lung-fish (*Protopterus*) that range in length up to four feet. Various methods are employed by the natives in catching the edible sorts, quantities of which are dried and later sold to the pigmies of the Ituri Forest, a considerable distance away. It is a most remarkable fact that no crocodiles are to be found in the lake, and in the Belgian reserve rhinoceroses, giraffes, zebras, ostriches, hartebeestes, and gazelles are non-existent, whereas all these creatures abound in the Masai Reserve, Kenya Colony.

Bantu Woman with her Baby, near Lake Kivu.

The background shows rock strata.

I secured as specimens a very fine pair of defassa waterbuck, *Cobus defassa* ; both of them possess sub-auricular "glandular" patches, peculiarities rarely found in any species of waterbuck. Altogether I have examined some eighty specimens in museums and in other collections, and only amongst two of these could I find this glandular development. One specimen, different in species from that collected by myself, came from West Africa, thereby proving that the glandular development is not a specific character. The genus *Cobus* usually lacks this characteristic, which is peculiar to a totally different genus, *Redunca*, embracing several species of reedbuck. Female skins are rare in collections, and the complete skin of my specimen is the only one known to be in existence which has this peculiar patch.



TRAP USED FOR KILLING ELEPHANTS IN THE ITURI FOREST BY THE PIGMIES.

The method was shown in the open because the Forest is too dark for photography. A spear, with a heavy wooden weight attached, is suspended over the path and is held by string set across the path. The elephant breaks the string in passing and releases the weighted spear, which falls upon the victim.

My specimens were exhibited by Capt. Guy Dollman * at the meeting of the Linnean Society held on February 18, 1932, and have since been presented to the Trustees of the British Museum.

The buffaloes living in the plain of the Park are similar to those found in South and East Africa throughout dry regions. They are large animals, black in colour, and with a magnificent spread of horns. In bulls this spread averages forty inches. The escarpment of the Mitumba Range at Kabasha is about 2000 feet above the Lake, and past this barrier the large buffalo is not known to travel. An intermediate type between itself and the red bush cow of the Ituri Forest replaces it here. The examples known to me are large in size and red in colour, and along the centre of the back have a peculiar black stripe. A comparison of these specimens proves that the buffalo is a sedentary animal, never ranging far afield. It may be mentioned in passing, however, that elephants are known to pass this escarpment from forest to plain, or vice versa.

NATIVE HOLDING FISH CAUGHT IN LAKE EDWARD IN THE TRAP SEEN ON THE LEFT.

This fish, when dried, is sold to the Pigmies in the Ituri Forest, a considerable distance away.

My return journey was made through the Ituri Forest to Lake Albert, where a fairly good motor road has recently been constructed. Along it are several privately owned hotels, so that travelling and transport present few difficulties, and tents and such-like gear are therefore not necessities along this stretch.

On reaching Butiaba I left by flying boat for Cairo.

* Capt. Guy Dollman, " Development of auricular ' glandular ' patches in the Waterbuck," *Proc. Linn. Soc. London*, 1931–32, pp. 86–87.

BOOK NOTICES.

The Psychology of Animals in relation to Human Psychology. By F. ALVERDES. Translated by H. Stafford Hatfield. Pp. viii + 156. (London: Kegan Paul, Trench, Trübner & Co., Ltd. 1932. 9*s*.)

OF recent years biological speculation has, especially in this country, been largely in the hands of chemists—they are none the less chemists for the prefix *bio* to their designation—who seem to be incapable of distinguishing between their science and biology, or of mathematicians who by the very nature of their instrument abstract from their material all content except number. It is therefore heartening to find a book by a biologist—the author is professor of zoology at Marburg—who attaches some meaning to the concept of organism and treats his science as a branch of knowledge with standards of its own. In the beginning he explains his view of the organism as an actively self-maintaining unity on lines similar to those of J. S. Haldane, and enunciates a principle for the interpretation of animal behaviour. This principle is that the end determines the means or the whole determines the parts, and by the whole or end he implies the final state of some activity or process, the parts or means being the stages leading up to it. He is careful to explain that an end is not a consciously grasped objective, but simply the object which we regard as determining an observed biological activity. In the light of this principle he reviews a large number of observations on regeneration and on the behaviour, chiefly locomotive, of the less highly organized animal forms, protozoa, platyhelminths, echinoderms, and annelids. He shows for example that in the ciliated protozoan *Paramecium*, which has many thousands of similar locomotive organs, the cilia, when separated from the body, carry out independent motion of a completely stereotyped kind: but when connected in a normal manner with the living cell they always obey the unitary impulses proceeding from within. The ciliated protozoa, the free-swimming turbellarians and the starfishes have this in common, that their locomotive apparatus consists of a large number of similar individual elements, cilia or tube-feet, and these by working in strict coordination produce a unitary movement of the whole body. These animals supply illustrations of his principle that the end determines the means. For the end or whole is the locomotion of the body in a given direction, and to this are sub-ordinated the means or the parts, which in this case are the changes of movement of the individual cilia or tube-feet to meet the momentary situation.

He rejects the view that animals are the slaves of their surroundings or of their sense organs and have to react automatically to every external stimulus. On the contrary, he maintains that sense impressions are only guides to it. Of course an animal may be decisively influenced by an external factor such as an enemy, or by an inward physiological factor such as hunger or want of oxygen, but apart from such compulsions, an animal may act spontaneously. An animal may run, swim, or fly without any change in its surroundings, and whether, where and when it comes to rest are also decided in the first place by its spontaneity. This spontaneity he explains from the standpoint of hormic psychology as the expression of an original inborn drive present in all living creatures, which manifests itself in activity of all kinds. Incidentally he makes a detailed criticism of Loeb's theory of tropisms, and shows convincingly that it is not supported by the experimental evidence.

The problem of animal consciousness he regards as insoluble on the ground that we cannot form any conception of what the consciousness of an animal may be like; and it should therefore, he holds, be excluded from animal psychology. It would seem to be a logical procedure to assume some kind of consciousness in animals analogous to our own when apparently conscious behaviour can be discerned. This is what, in fact, we do in our relations with other human beings. Moreover, he accepts von Uexküll's view of environment, and this view implies the presence of a sort of consciousness in animals. According to von Uexküll each species selects from its surroundings what is biologically important for it and what is capable of being grasped by its sense organs. Thus for an earthworm there are only "earthworm-things," for a dog only "dog-things," and so on. This is for the author the true environment, and two animals of different species under identical conditions have quite different relative environments.

The author belongs to the Gestalt school of German and Austrian psychologists and devotes a chapter to the explanation of some of its principles. The fundamental principle of Gestalt is that there is more in any psychological whole than the sum of its parts. The recognition of an object does not take place additively by the putting together of the separate sense impressions of its characteristics, but the object is grasped as a whole. The object, tree, chair, dog, or whatever it may be, is first apprehended as a whole and only afterwards its individual characteristics may be noticed according to the degree of attention given to it. The principle holds equally good for animals, and in the author's words, "the first alarm which the animal receives of the presence in its neighbourhood of an enemy, a prey, or a sexual partner, may be given by single data of one of the senses: hearing, sight, smell or touch; on the other hand, the way the new arrival is dealt with, the defence against the enemy, the attack on the prey, the act of copulation, is always a matter of the whole." This capacity to grasp things as wholes is an inborn thing and arises out of the inmost constitution of the organism.

He distinguishes between primary and secondary knowledge, primary knowledge being what is usually known as instinct and secondary knowledge being the knowledge acquired by practice and experience, and cites the large part that consciousness plays in, for example, human sexual action to combat the view that instinctive actions are unconscious. Primary and secondary knowledge are not to be regarded as opposed, for empirical knowledge helps to perfect primary knowledge, and certain types of activity such as nest-building are informed by both types of knowledge. Many instinctive actions are plastic and capable of modification by experience.

He calls attention to the fact that in our dealings with other human beings we have two methods of grasping their behaviour, that of understanding, by which he means a process of direct sympathy and comprehension, and that of explaining, which is mainly a matter of rational consideration and experience, and suggests that where the behaviour of animals is analogous to our own we may make use of the understanding and sympathetic method along with the explanatory in animal psychology.

The author contributes a very interesting chapter on animal sociology and puts forward the suggestion that animal matings, animal families and animal societies, provided that the constituent individuals during a relationship show themselves to be linked to one another inwardly, should be regarded as super-individual wholes. The behaviour of the individuals can then only be understood in the light of their relation to the larger unity.

It need hardly be said that this extremely interesting book covers a vast field. In fact it might justly be criticized on the ground that it deals with too much in too little space. The author, not content with biology and psychology and moved, no doubt, by the German passion for massive synthesis, introduces a lot of somewhat irrelevant metaphysical argument. He reveals himself as a follower of Vaihinger and a member of the *Als ob* school of Fictionists. This school contends that mind, originally simply an aid in the struggle for existence, has outgrown its function. Thought is no longer a means to an end but an end in itself, with the consequence that the mind sets itself tasks for which it is wholly unfitted. The speculative reason serves like the Ghost in Hamlet to make us poor fools of nature so horridly to shake our dispositions with thoughts beyond the reaches of our souls. Reality is both unknowable and irrational, a statement which itself implies a knowledge of reality; and all our theoretical thinking, by which we attempt to introduce a unity into things, ends in the creation of fictions. According to the author, a fiction is a construction which renders intelligible diverse processes or events; and has, so to speak, no counterpart in the real. Thus causality, freedom of the will, mechanism, vitalism, the principle that the end determines the means and so on are fictions. We are, in the end, left with an impenetrable fence on one side of which are appearances and on the other the unknowable Thing. This is the old phenomenalist argument in a party dress, and the reviewer can only record his assent to Bradley's conclusion that "the assertion of a reality falling outside knowledge is quite nonsensical."

The Life of the Butterfly. By Friedrich Schnack. Translated by Winifred Katzin. Pp. 278. (London: George Allen and Unwin, Ltd. 1932. 7*s*. 6*d*.)

The thirty-five chapters of this entertaining and highly imaginative little book are devoted each to a separate species of butterfly or moth. "Of what dim intimations are they the luminous word? It may be they have brought us down the colours of the Paradise we lost, perhaps that was the earth from which they drew their roots, as the gates fell to which shut us out for ever . . . an angel sent a host of butterflies to follow us into exile . . . lilies whose gold we bartered for our folly's dress . . . abandoned speedwell . . . the clover of good omen gambled away . . . timeless sunflowers." This, extracted from the dedication, is a fair sample of the author's gently wandering fancy. But there is not a little to be learnt of the ways of butterflies from the careful observations of Herr Friedrich Schnack, to whom their appeal is both intense and unfailing; yet unless the reader is willing to follow him in kindred vein through his flower-spangled German meadows, his dark and ominous Jura and the scorching sands of the Sahara, dreaming of tales of Araby, finding in his butterflies the reincarnate heroines of Greek mythology, and Elysium in a mud-puddle surrounded by Purple Emperors, then he had better not read him. But there are Leander of the butterfly house, whose influence on the author is so great—a man able to produce gynandromorphs experimentally—and the glazier who spends furtive evenings painting fantastic butterflies for his own delectation; these provide themes of more mundane origin, to run through the book and furnish mounting stones to those higher realms of fanciful imagery where the author delights to let his mind wander unfettered. Yet the book is wholly delightful and has the added spirit of being both informative and accurate. The author is not to blame that some of his sprites are unrecognizable to the English reader under the names chosen for them by the translator, who, however, may readily be forgiven when there is set in the balance the charming performance of her main duties.

Snakes. By F. W. Fitzsimons. Pp. xiv + 286, with 44 illustrations on 16 plates. (London: Hutchinson & Co., Ltd. 1932. 10*s*. 6*d*.)

This is not a book of natural history, but rather a collection of snake stories, ancient and modern, together with a good measure of advertisement of the

Port Elizabeth "Snake Park," its staff and its products. Snakes are only considered in their relations to man, and the more sensational or amusing these relations are the greater the gusto with which they are recounted. There is a great deal of reiteration and the literary style will not commend itself to the purist; but the most objectionable feature of the book is the unblushing "boosting" of secret remedies of unproved value.

MUSEUM NEWS.

His Highness the Aga Khan visited the Museum on November 25, and was received by the Director.

* * * * * * * *

The Principal Trustees of the British Museum appointed Mr. N. D. Riley Keeper of the Department of Entomology in succession to Major E. E. Austen, D.S.O., and Mr. K. G. Blair, B.Sc., of the same Department, Deputy Keeper.

Mr. Norman Denbigh Riley filled one of the new Deputy Keeperships created in 1931. An account of his career appears in this Magazine, vol. iii, p. 80.

Mr. Kenneth Gloyne Blair was educated at Highgate School and Birkbeck College, graduating with the degree of B.Sc. at London University in 1909. He joined the Civil Service as a Second Division Clerk, and was transferred to the Insect Section, as it then was, of the Department of Zoology as Second-Class Assistant (now Assistant Keeper) on November 30, 1910.

* * * * * * * *

Mr. William Plane Pycraft, Assistant Keeper, Department of Zoology, retired from the service of the Trustees on reaching the age of sixty-five on January 13. Mr. Pycraft was appointed to an Assistantship in that Department on July 5, 1907. Previously he was assistant to the Linacre Professor of Comparative Anatomy at Oxford University. He has had charge of the Osteological Collection at the Museum, and is well known as the author of many popular books on natural history subjects.

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The Trustees have promoted Mr. R. J. West to the Higher Grade Technical Assistantship vacated by the retirement of Mr. T. F. Vincent on December 20.

Mr. Thomas Frederick Vincent first joined the staff as a Boy Attendant on June 9, 1887, and thus had the exceptionally long service of over forty-five years, all spent in the Department of Mineralogy.

Mr. Reginald James West entered the Museum as a Boy Attendant on November 19, 1894; he is in the Department of Entomology.

* * * * * * * *

Mr. W. H. T. Tams, Assistant Keeper, Department of Entomology, and Mr. A. W. Exell, Assistant Keeper, Department of Botany, left England on October 1 to study and collect insect fauna and flora, respectively, in the Spanish islands, Fernando Po and Annobon, and the Portuguese islands, São Thomé and Principe. They are expected back about the middle of April.

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In connexion with the forthcoming expedition to Mount Everest an exhibition illustrating the natural history of the Himalaya Mountains has been placed in the Central Hall. The specimens were selected from those collected by naturalists on previous expeditions.

* * * * * * * *

From February 1 the earlier daily tour of the Guide Lecturer will be 11.30 a.m. instead of 12 noon. The afternoon tour will still be at 3.

ACQUISITIONS.

Department of Zoology.

The whole of the private collection of Alcyonarian corals belonging to the donor; presented by Sir J. Arthur Thomson.

An important collection chiefly of mammals and birds made by the donors in Upper Burma; presented by Lord Cranbrook and Capt. F. Kingdon Ward.

A rare marsupial mole, known to the natives as Arru-jarru-ju, from South Australia; presented by Mrs. Daisy Bates.

The skull of a small race of elephant from the Gola Forest, Sierra Leone; presented by His Excellency the Governor of Sierra Leone.

The skulls of two dugongs and a lioness collected by the donor at Mafia Island; presented by Mr. W. B. Savory.

The head of a fine mountain reedbuck shot by the late Colonel Sir R. Rankin, Bart., near Bloemfontein; presented by Sir H. Stewart-Rankin, Bart.

Molar teeth of a large bull elephant shot in Burma by the donor; presented by Major-General F. J. Marshall, C.B., C.M.G., D.S.O.

A collection of mammals from the South Cameroons formed by the donor; presented by Major P. H. G. Powell-Cotton.

A collection of heads, mostly of East African game animals, including a Lesser Kudu and a Bushbuck of exceptional measurements, shot by the late Mr. A. Neumann; presented by Mrs. J. D. Neumann.

Three leopards from Rajputana; presented by His Highness the Maharajah of Bikaner.

Skins and skulls of the snow leopard from the Gilgit district, Kashmir; presented by Capt. W. R. F. Trevelyan.

Skulls of a chita and a hippopotamus from Nigeria; presented by Mr. A. Miller.

A mounted specimen of an Irish wolfhound; presented by Mrs. Knox.

A mounted specimen of a Welsh terrier; presented by Mr. Walter S. Glynn.

A collection of 98 mammals from Honduras, including a squirrel and a hare new to the Collection; purchased.

A specimen of the rare flightless scaly-tail *Zenkerella insignis*; purchased.

Department of Entomology.

A collection, comprising over 17,000 specimens, including 430 types and 750 paratypes, of thrips formed by Dr. R. S. Bagnall; purchased.

A collection of about 8,000 insects of various orders but mainly diptera made by Miss D. Aubertin and Miss E. Trewavas in the High Tatra Mountains, Poland.

Department of Geology.

A large collection of invertebrate fossils from Madagascar, including a fine series of ammonites representing most of the local formations in the Jurassic and Cretaceous series; presented by the Director of the Geological Survey of Madagascar.

The collection of fossils made by Mr. H. St. J. Philby on his journey across the Arabian desert; presented by His Majesty the King of the Hejaz and Nejd.

A series of shells of Lower Tertiary age preserved in a remarkable kind of flint; presented by the Government Geologist of the Anglo-Egyptian Sudan.

Department of Mineralogy.

A large selection of pieces of meteoric iron with a total weight of 604 lb. and silica-glass and iron-shale found with them, from the meteorite craters discovered in 1931 near Henbury, Central Australia; acquired from the Kyancutta Museum, South Australia.

A fine mass of ruby, showing crystals grown in parallel position, weighing 690 grams (3450 carats), from the Ruby mines, Mogok, Upper Burma; purchased.

Specimens of the new mineral, bultfonteinite, from the Jagersfontein diamond mine, Orange Free State, South Africa; presented by Mr. Alpheus F. Williams.

Specimens of copper ores from the newly discovered deposits at Barrow's Creek, Central Australia; presented by Dr. Herbert Basedow.

Minute crystals from concentrates from platiniferous rocks of the Transvaal, including cooperite, laurite, sperrylite, platinum, and braggite (the last being the first new mineral to be discovered by X-ray methods of investigation); presented by Potgietersrust Platinums Limited.

Rocks collected by Prof. Leonid A. Kulik in 1927–1930 from the district in Siberia where the great meteorite fell on June 30, 1908; presented by Mr. R. Kirkpatrick.

An inlaid mahogany cabinet of ten drawers, containing 570 models of crystals in wood, also a pocket blowpipe, formerly the property of William Hyde Wollaston, F.R.S. (1766–1828); presented by Mrs. F. R. Wollaston.

Large polished slabs of orbicular diorite from Alderney; purchased.

A series of specimens of Norwegian minerals selected from the extensive collection of Tellef Dahll (1825–1893) and recent finds of Norwegian minerals; purchased.

Faceted black spinel from Siam; purchased.

Department of Botany.

882 drawings and descriptions of British Plants made by the donor's great-aunt, Miss Ellen Hawkins, who died in 1864; presented by Miss E. Hombersley.

697 specimens of flowering plants collected chiefly in the Lunda province of Angola by Mr. R. G. N. Young; presented by the Trustees of the Godman Exploration Fund.

49 specimens of Aegilops, which include all the known species of this genus of grasses; presented by Prof. John Percival.

The original manuscript and drawings of the Tabular Distribution of the Vegetable Kingdom by John Stuart, third Earl of Bute; presented by Mr. Reginald Cory.

A further set of Tanganyika plants collected by Mr. H. J. Schlieben; purchased.

668 specimens of Brazilian and Mexican plants collected by Mr. Y. Mexia; purchased.

Natural History Magazine

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THE NATURAL HISTORY MUSEUM (DAS MUSEUM FÜR NATURKUNDE), BERLIN.*

By PROF. C. ZIMMER, Director, Natural History Museum, Berlin.

THE Natural History Museum (Museum für Naturkunde) at Berlin is immediately associated with the University of Berlin. When the latter was founded in 1809, Frederick William III, King of Prussia, decreed that the Royal Mineral Cabinet (Königliches Mineralien-Kabinett), which until then had been housed at the Mint, and the zoological collections of the Royal Art Cabinet (Königliche Kunstkammer) should be combined and placed in the University building, and henceforth should serve for the teaching purposes of the University and further be open to the public for their instruction and enlightenment.

The Mineral Cabinet had been founded in the year 1789, and at that time was made up of two collections bought by the State and one which had been presented. The Royal Art Cabinet contained among many divers objects a number of zoological specimens, among them being 40 mammals, 260 birds, the famous collection of fishes and reptiles formed by Bloch,† the Herbst ‡ collection of crabs, the Pallas § collection of Siberian fishes and amphibians, the Riemer || collection of insects, and two cases of shells. To these were added in the year 1810 as a gift the collection of about 1000 specimens of Brazilian mammals and birds belonging to the Graf von Hoffmannsegg ¶ and, likewise as a gift, the world-famous zoophyte collection of Gerresheim.**

In the year 1814 these collections were removed to the then newly-erected University building. There was, to be sure, not a great deal of space allocated to them, only four rooms for the Zoological Museum and even fewer for the Mineralogical Museum.

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* Translated from the original German.

† Marcus Elieser Bloch, 1723–99.

‡ Johann Friedrich Wilhelm Herbst, 1743–1807.

§ Peter Simon Pallas, 1741–1811.

|| Riemer, nothing is known of him.

¶ Johann Centurius Graf von Hoffmannsegg, 1766–1849.

** Hofrat Dr. Adolf Gerresheim, ?–1812.

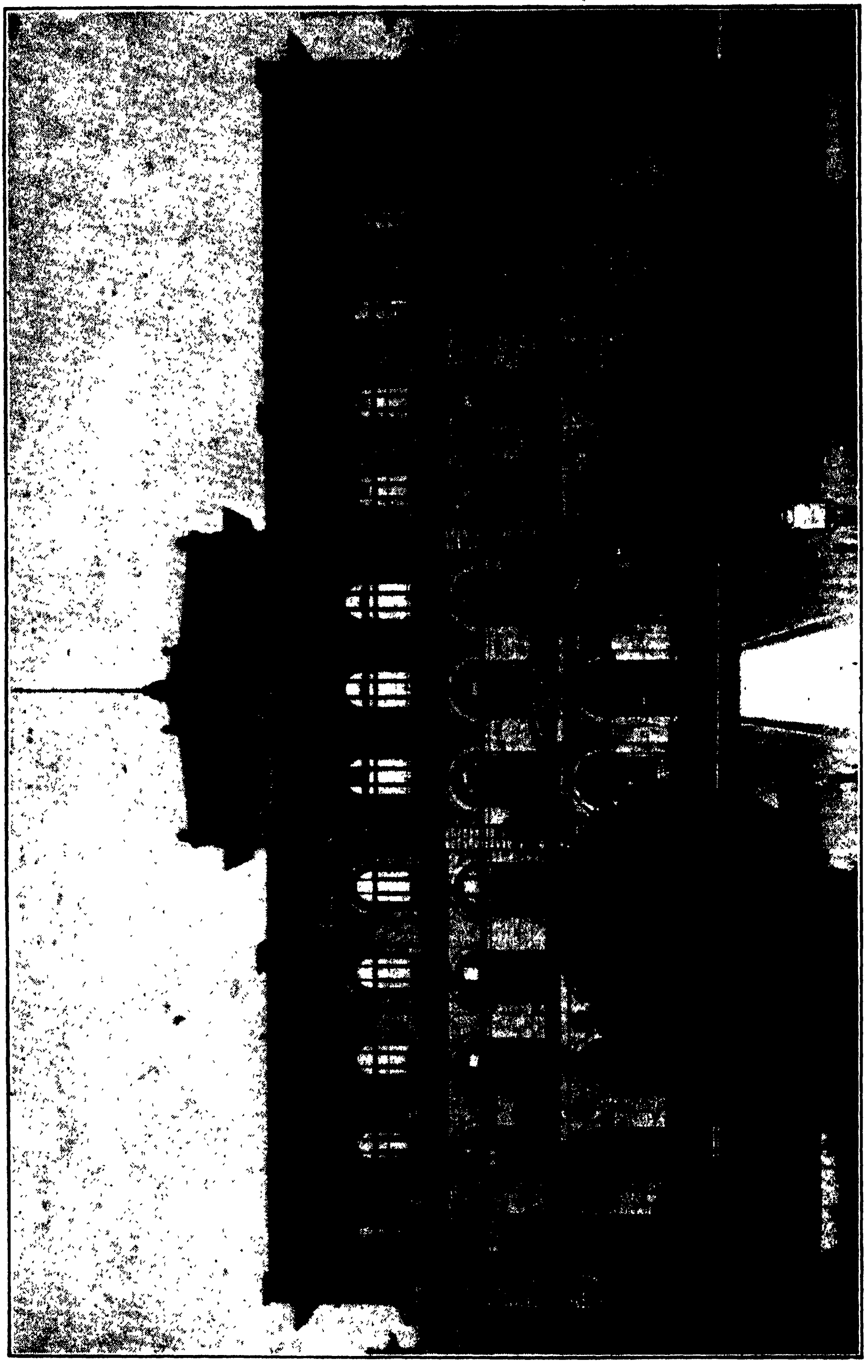

Fig. 1.—Natural History Museum, Berlin. Front

With the rapid growth of the Museums in the course of the nineteenth century more and more rooms in the University building had to be given up to them, until the time came when no further space could be found. The Natural History Museum was therefore built, and in the year 1889 was inaugurated as a new and worthy home for the Collections. The building still retains its original exterior form (Fig. 1), which is in the renaissance style of architecture, but it has been enlarged by an extension which was begun before the War and completed during its course.

The Natural History Museum forms, in conjunction with the Agricultural College (Die Landwirtschaftliche Hochschule), including the Agricultural Museum (Das Landwirtschaftliche Museum), and the Prussian Geological Institution (Die Preussische Geologische Landesanstalt), including the Provincial Geological Museum (Das Geologische Landesmuseum) and the Museum for Applied Geology (Das Museum für angewandte Geologie), a large group of public buildings in the Invalidenstrasse.

The Natural History Museum comprises the following four institutions of the University of Berlin :—

(1) The Mineralogical-Petrographical Institute and Museum (Das Mineralogisch-Petrographische Institut und Museum);
(2) The Geological-Palæontological Institute and Museum (Das Geologisch-Palæontologische Institut und Museum);
(3) The Zoological Museum (Das Zoologische Museum);
(4) The Zoological Institute (Das Zoologische Institut).

These four institutions are entirely independent of one another; there is no governing body in common and only a general control of the building, which, however, involves no interference with the administration of the several institutions.

The Zoological Institute provides for the requirements both of research and of the University, while the other three institutions deal in addition with the instruction of the public. The ground floor of the building is occupied by the general exhibition galleries, and on the upper floors are the store-rooms, offices, and studies. The floor-space is distributed as follows :—

	Square metres.
Zoological Institute	2250
Mineralogical-Petrographical Museum and Institute :	
Exhibition Collection	650
Reserve Collection and Studies	1630

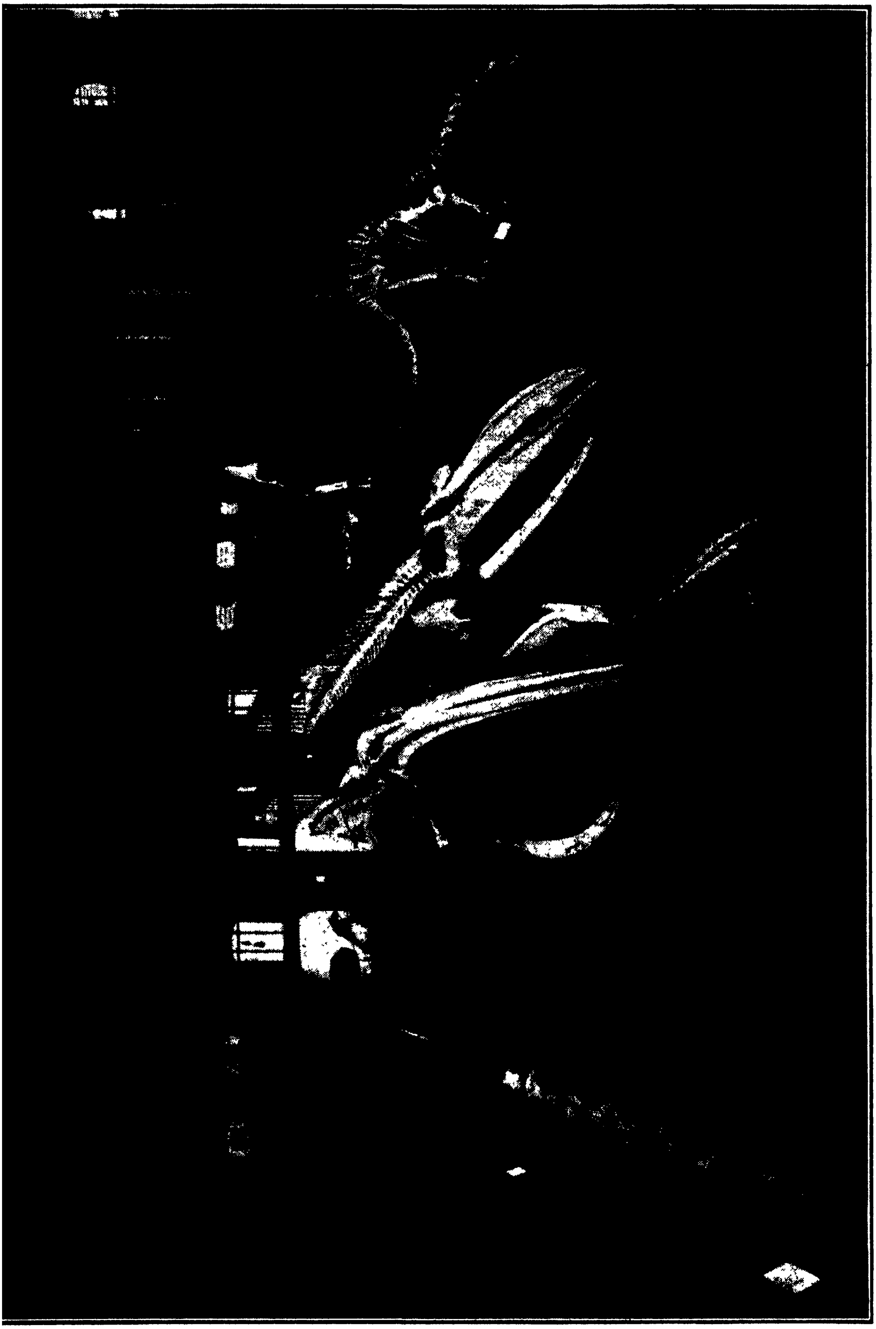

FIG. 2.—CENTRE COURT (LICHTHOF). CENTRE, WHALE SKELETONS; SIDES, SAURIAN SKELETONS.

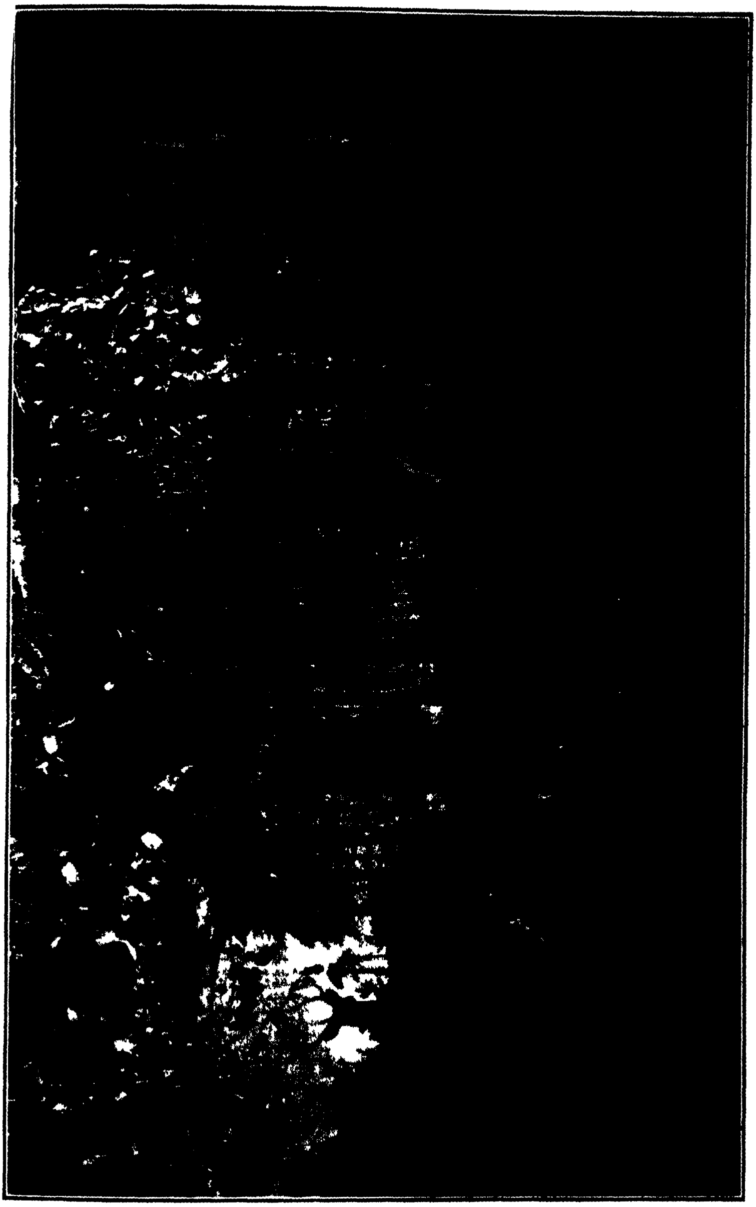

FIG. 3.—RED DEER GROUP, RIGHT HALF. (Animal Life of Germany series.)

	Square metres.
Geological-Palæontological Museum and Institute :	
Exhibition Collection	1050
Reserve Collection and Studies	2440
Zoological Museum :	
Exhibition Collection	5400
Reserve Collection and Studies	14510

The exhibited collections of the Mineralogical-Petrographical Museum occupy two galleries, of which the one contains a series of minerals arranged according to the mineralogical system, and collections of meteorites, radioactive minerals, gemstones, etc., and the other is devoted to igneous and stratigraphical rocks.

FIG. 4.—PARTRIDGE GROUP. (Animal Life of Germany series.)

The exhibited collection of the Geological-Palæontological Museum is accommodated in two halls, and in addition shares with the Zoological Museum the large Centre Court (Lichthof), which, however, will eventually be devoted to the former only. Of the exhibition galleries the one contains a collection of fossils arranged by species, and the other a geological collection. In the Court are accommodated large fossilized skeletons of mammals and reptiles, among the latter being the giant dinosaurs brought back by the Tendaguru expeditions.

By far the largest part of the exhibition space is occupied by the Zoological Museum. It comprises eleven halls as well as part of the Centre Court (Lichthof), in which are accommodated the skeletons of whales and various other animals of large size (Fig. 2). Of the specimens in the Zoological Museum, estimated to number upwards of twelve millions, only a bare quarter per cent. is exhibited; the remainder are stored in the reserve collection. The distribution of the eleven halls is as follows: Four to the Animal Life of Germany (Deutsche Tierwelt); two to mammals; and only one each to birds, cold-blooded vertebrates, invertebrates, comparative anatomy, and comparative biology. It should be noted that the halls are not of equal size, varying, as they do, between 235 and 670 square metres. This distribution of the material in the several halls is, however, not final, as the exhibited series of zoological specimens is undergoing a radical reorganization, the object of which is to render the exhibition galleries more instructive and more attractive to the public than they have been hitherto. The attainment of this object is being achieved in a twofold way. Less attention is devoted to taxonomy and more to biology; at the same time the provision of labels is increased, and they are couched in simple language. The task of reorganization is finished, or all but finished, as regards the German fauna, the preparation of the Biological Hall, and the rearrangement of the Bird Hall.

FIG. 5.—GRASS SNAKE AND COMMON FROG CASE.
(Animal Life of Germany series.)

In the halls devoted to the Animal Life of Germany (Deutsche Tierwelt) a large number of habitat groups have been set up, which show the animals in their natural surroundings (Figs. 3, 4, 5).

The Biological Hall (Biologischer Saal) has been arranged so as to afford, by means of a series of specimen models, pictures, and drawings, a comparative view of the mode of life of animals (Figs. 6, 7, 8). Some of the subjects dealt with in this hall are: Movement of Animals, Biology of Nutrition and Digestion, Biology of Propagation, etc.

The rearrangement of the Bird Hall (Vogelsaal) is to be taken in hand at once. Previously the whole of it was devoted to systematic ornithology, but now the exhibits are divided into two series. In the one the birds are arranged in systematic order, but the mode of life of each species is illustrated as fully as possible by the addition of the nest and eggs and by photographs of the living bird; this series, which occupies a run of 68 metres of upright cases, illustrates therefore the "special biology" of birds. The other series illustrates the "comparative biology" of birds, and is contained in upright cases extending to a run of 48 metres, as well as in window-cases, measuring 14 metres in length (Figs. 9, 10). By degrees the other halls,

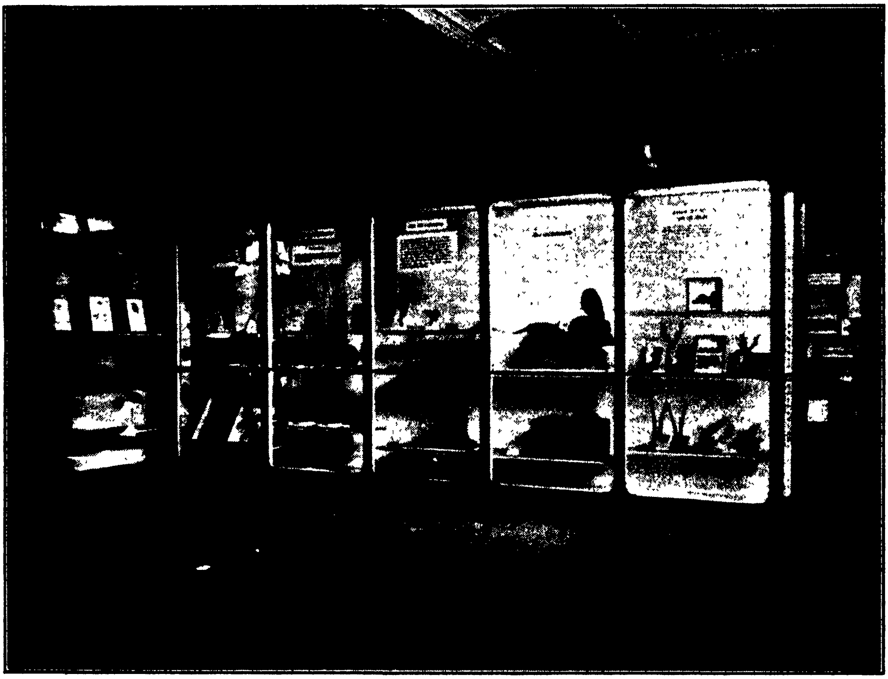

FIG. 6.—ROW OF CASES IN BIOLOGY HALL.

which are at present devoted to systematic zoology, will be similarly rearranged.

In order to afford the working classes better opportunity for

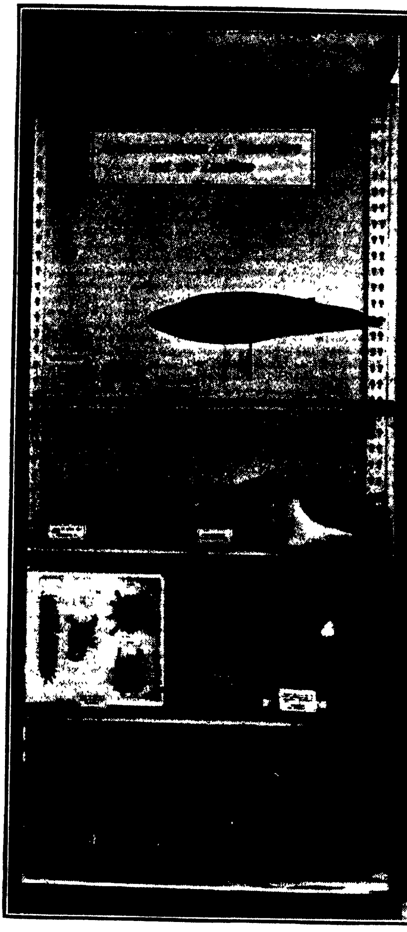

Fig. 7.—Case in Biology Hall. Comparison of size of Water and Land Animals.

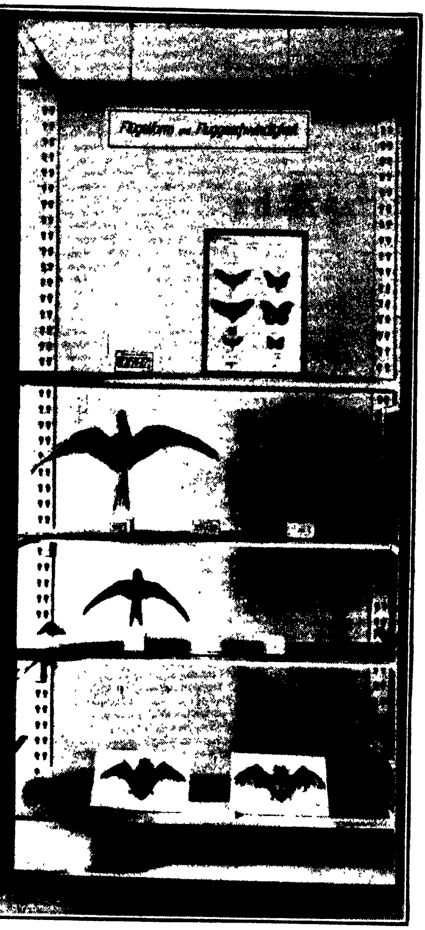

Fig. 8.—Case in Biology Hall. Strong flyers have longer and sharper wings than weak flyers.

visiting the Museum, the exhibition halls have been open free on Wednesday evenings for some years past, and on these occasions free elementary lectures have been given by the staff of the Museum. The Lecture Hall of the Zoological Museum, in which the lectures took place, is unfortunately very small, containing only 250 seats, and so successful was the lecture experiment that frequently the hall was crowded. Special exhibitions, too, have been arranged, which were changed every two or three months. All these enterprises, which were welcomed by all classes of the people, have been in abeyance since October 1, 1932, owing to the need for economy; but it is hoped that they will be revived so soon as times are better.

In the year 1867, when the constituent Museums were still in the University building, which is in the centre of the city, the number of visitors amounted to 40,000. At the present time the number is adversely affected by the unfavourable position of the Museum building some distance away from the busy traffic centre, so that despite the fact that the population of Berlin is from five to six times as large as it was in 1867, the number of visitors to the Natural History Museum has increased only to 60,000.

Fig. 9.—Case in Bird Hall.

The hours of opening of the Museum are as follows :—

Winter : Sunday, Monday, Wednesday, Thursday, Saturday, 10 a.m. to 2 p.m.

Summer: Sunday 10 a.m. to 4 p.m., Monday 10 a.m. to 1 p.m., Wednesday 5 to 9 p.m., Thursday 10 a.m. to 1 p.m., Saturday 10 a.m. to 2 p.m.

Fig. 10.—Two Cases in Bird Hall.

Left, adaptation of feeding apparatus, etc., in fish-eating birds; Right, in filter-feeders, mussel- and snail-eaters, and worm-eaters.

On Monday and Thursday an admission fee of 50 pfennigs is charged; on the three remaining days there is no charge. School classes in charge of a teacher are always allowed free admission.

BEHIND THE SCENES IN THE MUSEUM. II.

By W. E. SWINTON, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

IN the previous article * the general principles underlying the museum idea, and the function of the Natural History Museum in particular, were described, and something was said of the organization behind the exhibited series and of the methods by which these exhibits are interpreted for the public. In the strict sense perhaps these descriptions were not very much behind the scenes, except in so far as they supplied details or figures not readily obtainable by members of the general public. In this article and those to follow the duties of the Staff and the general activities of the Museum, in some form or another not directly under the public eye, will be described.

The Museum is a separate accounting department under the Trustees of the British Museum, and is administered by the Director. It consists essentially of five Departments—Zoology, Entomology, Geology, Mineralogy, and Botany—and the Director's Office with the house and maintenance staffs directly under its control. The work of the several Departments will be described later, and this article is devoted to the various duties of the Office and the sections under it. Firstly, there is the financial side of the Museum, the whole of which is dealt with in the Office, and secondly the staffs. Of course, although the scientific and technical staffs are directly responsible to the Keeper of their respective departments, the Office is concerned with the establishment as a whole, with the business of appointment, terms of employment, questions and payment of salary, and, alas, the deduction of income tax. The number of the staff thus affected is approximately three hundred, so that the internal administration is comparable with that of an average-sized factory, though there must be few industrial concerns which include so many various trades, arts, or crafts under one roof, or whose office contains an income tax department as well. Further, although every business of any pretensions must, or ought to, receive a large correspondence on its particular speciality, it is improbable that every conceivable aspect of that subject is dealt with. In the Museum the Office and Departments are under a constant bombardment of correspondence touching on every possible, and sometimes impossible, branch of natural history, and it may be of interest to know that within the last ten years the work of the Office and

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* *Natural History Magazine*, Jan. 1933, vol. iv, pp. 15–19.

particularly its correspondence, has increased threefold, although the executive staff is larger by only about ten per cent. Those writing books or pamphlets, or attempting to do so; those anxious to give lectures, to identify specimens, or merely know things for the sake of knowledge or for the hope of gain, commercially or otherwise; or even the person who is worried over an animal or plant in a puzzle; all contribute to the ever-flowing stream that has to be arrested, diverted to its appropriate channel, and finally dealt with. The Office receives most of this material and deals with it, and the serious question or contribution then finds its way to the appropriate Department and authority.

It may be thought that there is nothing very remarkable in this and nothing outside the scope of the ordinary large office. In a measure it is true, for the Museum Office is run with the same efficiency and equipment as are to be found in a modern business. It is well to realize this, for there appears to exist in the imagination of some persons, principally cartoonists and humorists, the idea that museums are administered by old gentlemen, in whom the oldness is more pronounced than the gentility, and whose ideas of efficiency or modernity are those of the Dark Ages. In the National Museums, at least, it should be stressed that the Office is efficient and modern in administrative ability, and that to it are added the duties of a government department and the facilities of a general information bureau. The Office has never registered any particular objection to this last function, largely because it is able to satisfy almost every serious student and because it desires to be helpful to each and every intelligent inquirer; but it may be asked whether it is really economical for certain otherwise careful persons to spend stationery and postage, and cause a government department to do likewise, in the inquiry and answer of a trifling problem which could be solved by consulting a sixpenny dictionary or a shilling encyclopædia. This is a serious observation and any objection to it can be answered in the same way as can any complaint that we appear to have stressed too much the work of the Office. The National Museums are public institutions, provided from public funds for the enjoyment, intellectual or æsthetic, of the general public, and that same public has consequently some right to know with what efficiency and economy its institutions are maintained. In this connexion we may take note of a recent article in a daily journal on the cost of museums, in which the cost of an individual visit was assessed by the simple, but quite erroneous method of dividing the total yearly grant or expenditure by the total attendance. If National Museums had no telephone or postal inquiries, no research work, no publications or students, such a figure might have some meaning; but in actual fact it is misleading. However, we shall discuss this main question in our final article.

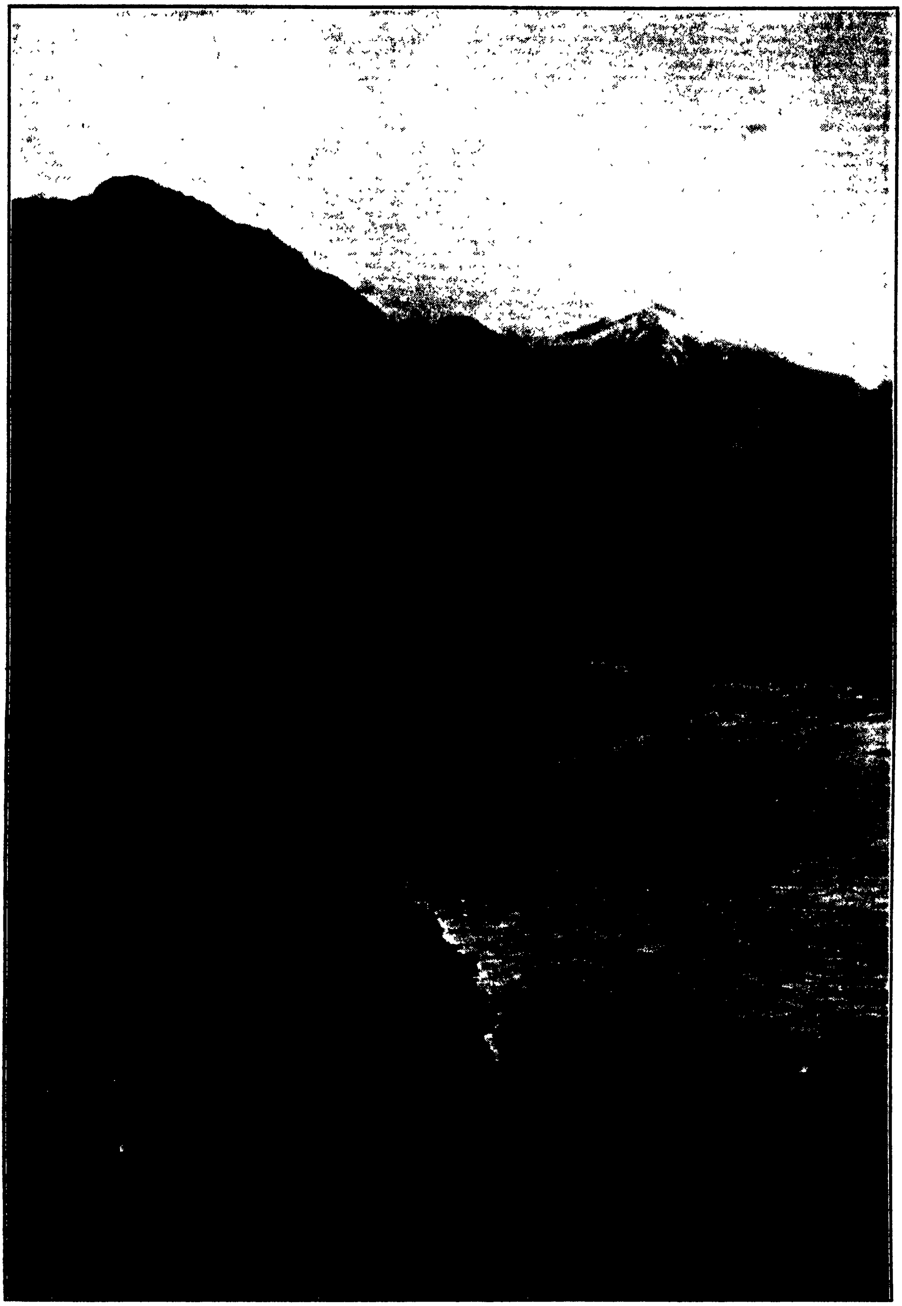
Enough, however, has been said of the ordinary aspect of the Office; what are its other cares? Perhaps the most important of these, as they may be the most expensive, are the various expeditions which from time to time make collections in different parts of the world. Much of the organization of these is done in the Office as well as the treatment of the general reports and accounts when the expedition is in the field, although the specialist aspect of the plans and the results are looked after by the appropriate Department. What both those tasks mean can only be appreciated fully by one who has organized an expedition. Transport arrangements must be made, provisions obtained and planned for, the complicated scientific apparatus selected, and the tangled skein of political courtesies and facilities unravelled. The results may be good and may long interest and stimulate the layman or the expert, but there is one aspect of these Office activities usually forgotten. Many a youth in a merchant's office has dreamed a whole panorama of delight provoked by some correspondence from a far Eastern land. Visions of palms, and the imaginary aroma of all the spices hang on such a slender thread. What visions could not be raised from the contents of the letter-files of a large natural history museum! There are notes, brief and even uninteresting it may be, but from what sources and such correspondents! Lines written in the African bush, or in the backwaters of some tropical river; notes from the icy wastes of the Antarctic or the Arctic; a scribbled field-note from the upper heights of Mount Everest. Even there have passed through these same files the flimsy sheets accompanying some Antarctic rock specimens which were dragged on sledge to the Pole itself and found eventually with the bodies of that Polar party. Perhaps, after all, it is as well that prosaic correspondence outnumbers the romantic.

Leaving the handwritten or typewritten word we may turn our attention to the printed word. The many publications, catalogues, guide-books, and post-cards which the Museum issues are published through the agency of the Office, and the stores and public bookstall are directly under its control. This in itself is no light undertaking, for the annual turnover is very large and all the publications are in great demand both by the public and museums. It is probably not generally realized that large quantities of the post-cards are every year sold to museums and printed under the names of these institutions. The material for the various cards and books is supplied generally by the Departments, but the actual publishing work is done in the Office, while the editorial work of this Magazine is also undertaken there. Packing, storing, or dispatch, and the reply to numerous inquiries, of course, occupy the whole-time attention of some members of the Staff. Of post-cards alone there are eleven hundred varieties in a stock of two millions, and more than one hundred thousand are sold annually. The Museum also does a large amount of its own printing, though it does not print any of the catalogues. All Museum labels for the exhibition and stored series are, however, done, and this naturally occupies most of the time of the printer. Any visitor knows that thousands of labels are on view, and it will readily be appreciated that even with the greatest care, they become dirty or faded and often out of date, so that apart from the steady demand for new labels a constant renewal is also required. Some of the labels are produced, in special circumstances, by His Majesty's Stationery Office. In addition to answering this steady and heavy demand the printer is required to produce many notices for circulation to the Staff and public, and advertisements of all lectures and publications. In fact, the duties would appear to be quite sufficient for the one man, which is the number that the Museum is now permitted to employ in this capacity. The equipment of the Printing Room (Fig. 1) is not suited for an increase in production as, of course, there is no linotype machine or power-driven printing press, and all the type is set by hand.

It has been mentioned that the printer does the advertisement notices of lectures, and these Museum lectures have already been described in the first article. But there is a further service done for lectures and lecturers by the Office; that is, the lending of lantern slides, of which a good selection is always available. Slides, some of them in colours, of such diverse subjects as protective coloration of animals, economic zoology, the evolution of elephants, camels, and horses, British birds and their nests, and minerals, can be had, and applications for a list, or for the loan, of them should be made to the Director. Approved lecturers can obtain these loans at a charge of two shillings and sixpence for twenty slides. Most of the slides in the collection have been made by the Museum photographer, who has no lack of employment in supplying the prints or negatives required for many purposes by the Staff. The illustration of exhibits, scientific papers, and articles for this Magazine all demand not only good but also absolutely accurate photographs, and the objects may be microscopic or as large as, or larger than, an elephant. In recent years the photographer has had various quarters, but the recent addition of a splendid new hall for the exhibition of whales afforded an opportunity of rebuilding part of the adjacent building and making a corridor between the two. The top of the corridor-bridge has been made into a fine studio with two dark-rooms (Fig. 2).

FIG. 1.—PRINTING ROOM.

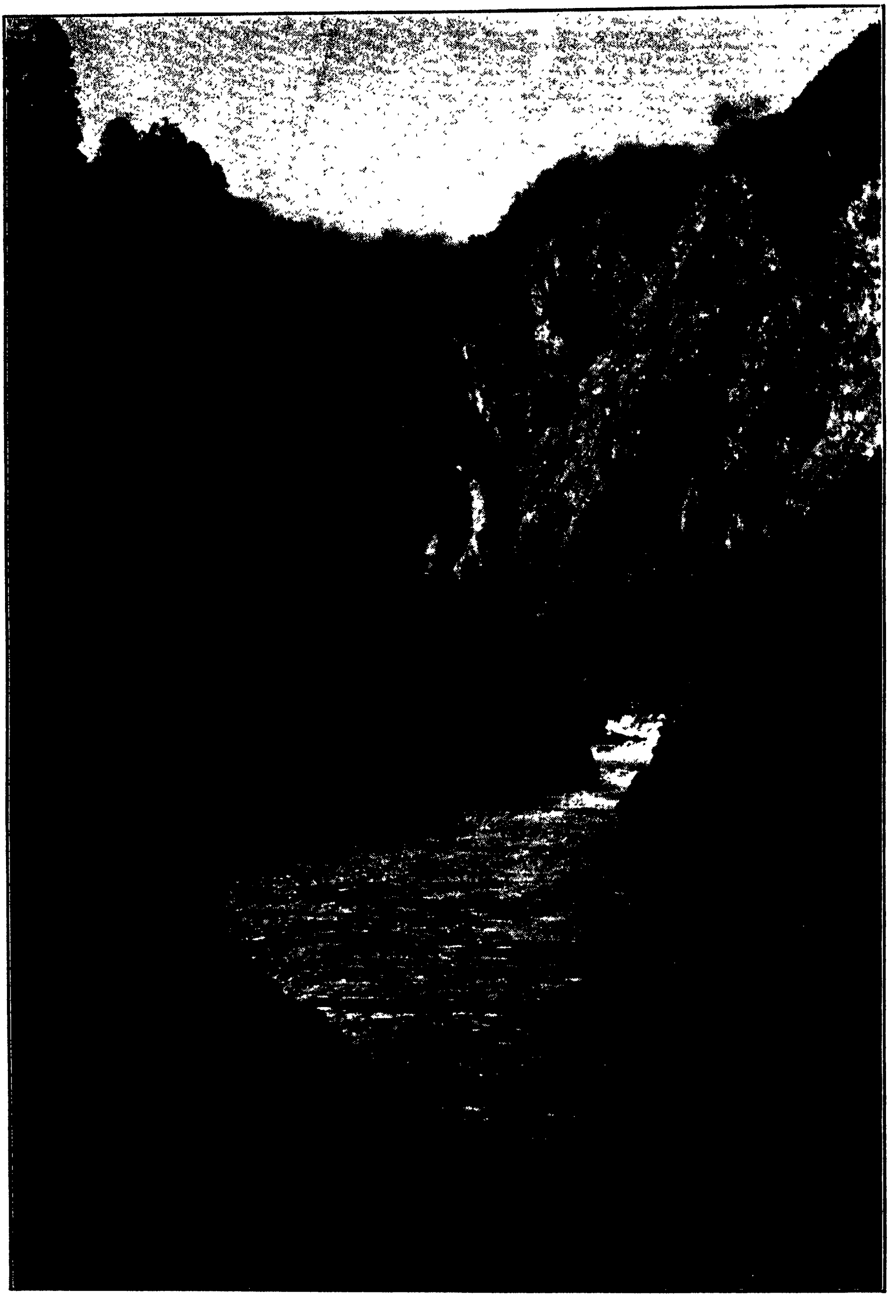
On the ground floor beneath the photographic studio is one of the most useful sections of the Museum, without which the task of every employee would be increased and the general efficiency greatly reduced. It is the telephone exchange, and merits some description, not only because of the constant use of the telephone but because so few people are conversant with exchange practice. During the hours of opening of the Museum the operator is a Post Office employee and not on the Museum Staff. The switchboard has at present one hundred and thirty-six extensions,



Photograph by courtesy of F. Kingdon-Ward.

GYAMDA RIVER, A TRIBUTARY OF THE TSANG-PO IN SOUTHERN TIBET.

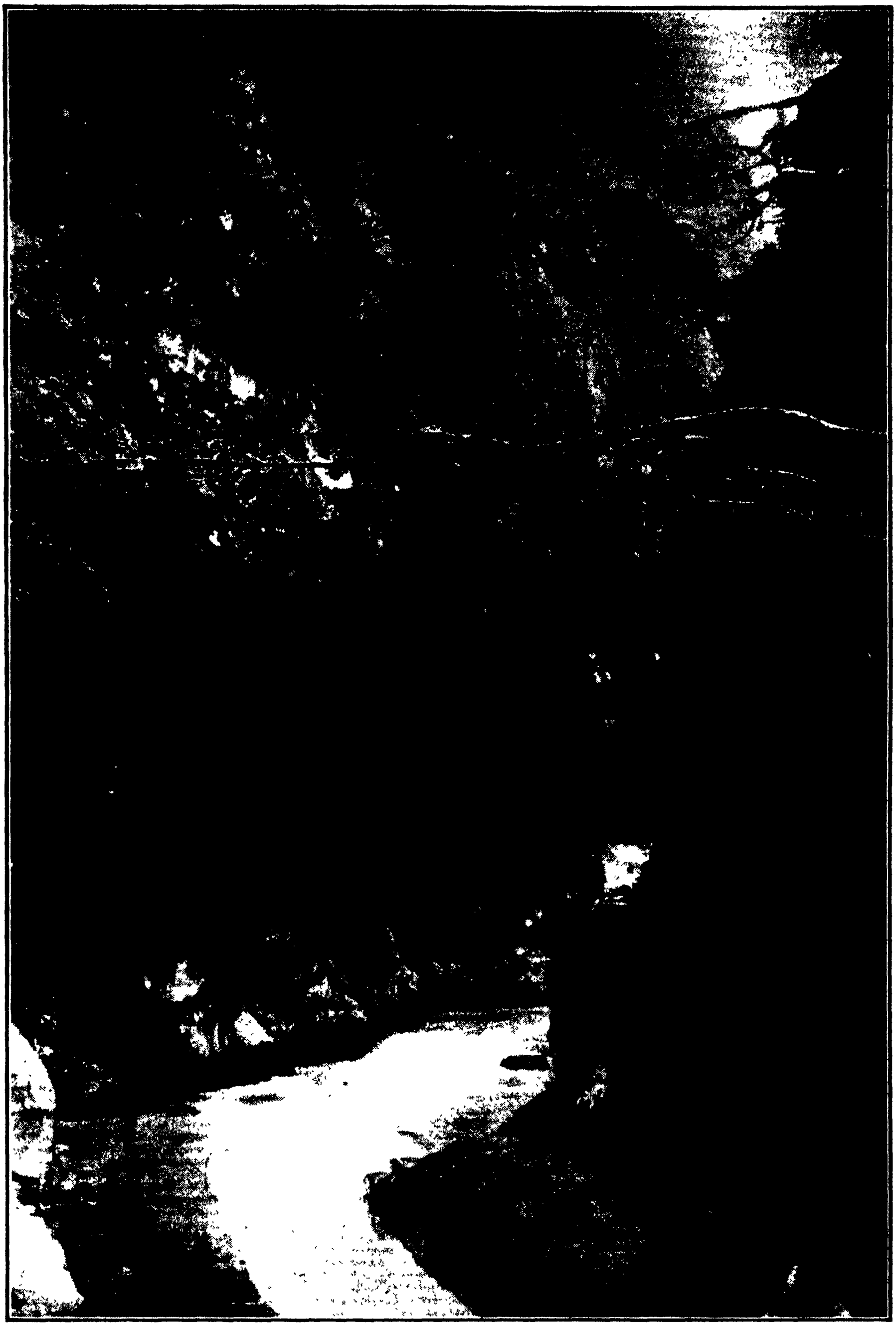
This part of Tibet is fertile and well populated. There is good grazing, and cultivation. Meadows of beautiful flowers and forests of fine trees abound. Travel is easy, and the tracks are fit for pony and yak transport.



Photograph by courtesy of F. Kingdon-Ward.

IN THE HEART OF THE GREAT GORGE OF THE TSANG-PO-BRAHMAPUTRA.

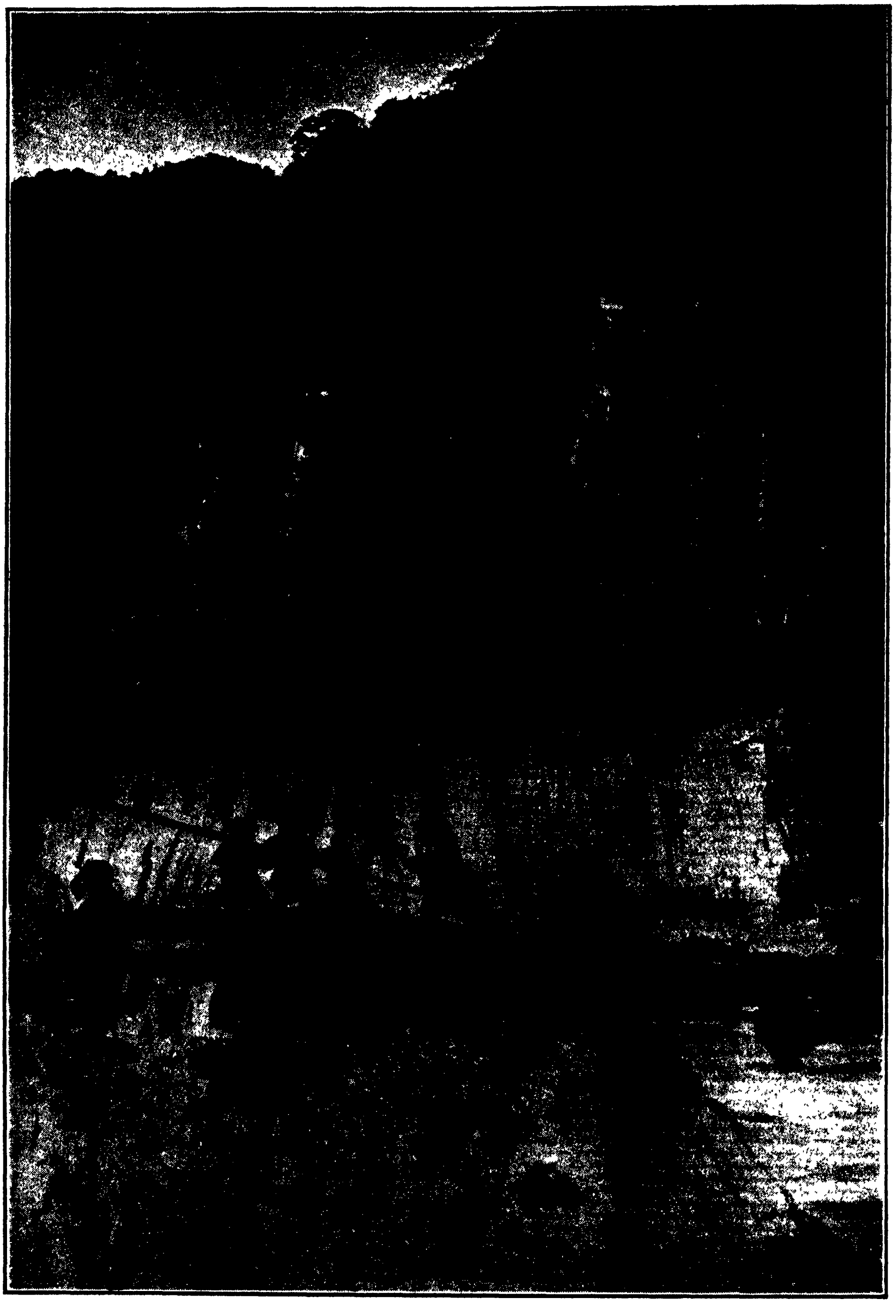
The Tsang-po, as it is called in Tibet, flows near Lhasa at an altitude of 11,000 feet in a bed nearly three miles wide. It eventually emerges on to the plains of Assam 600 feet above sea-level. In the course of its enormous descent from the Tibetan plateau it breaks through the Himalaya range in a terrific gorge.



Photograph by courtesy of F. Kingdon-Ward.

THE TIBETAN TSANG-PO IN THE CORE OF THE HIMALAYAN RANGE.

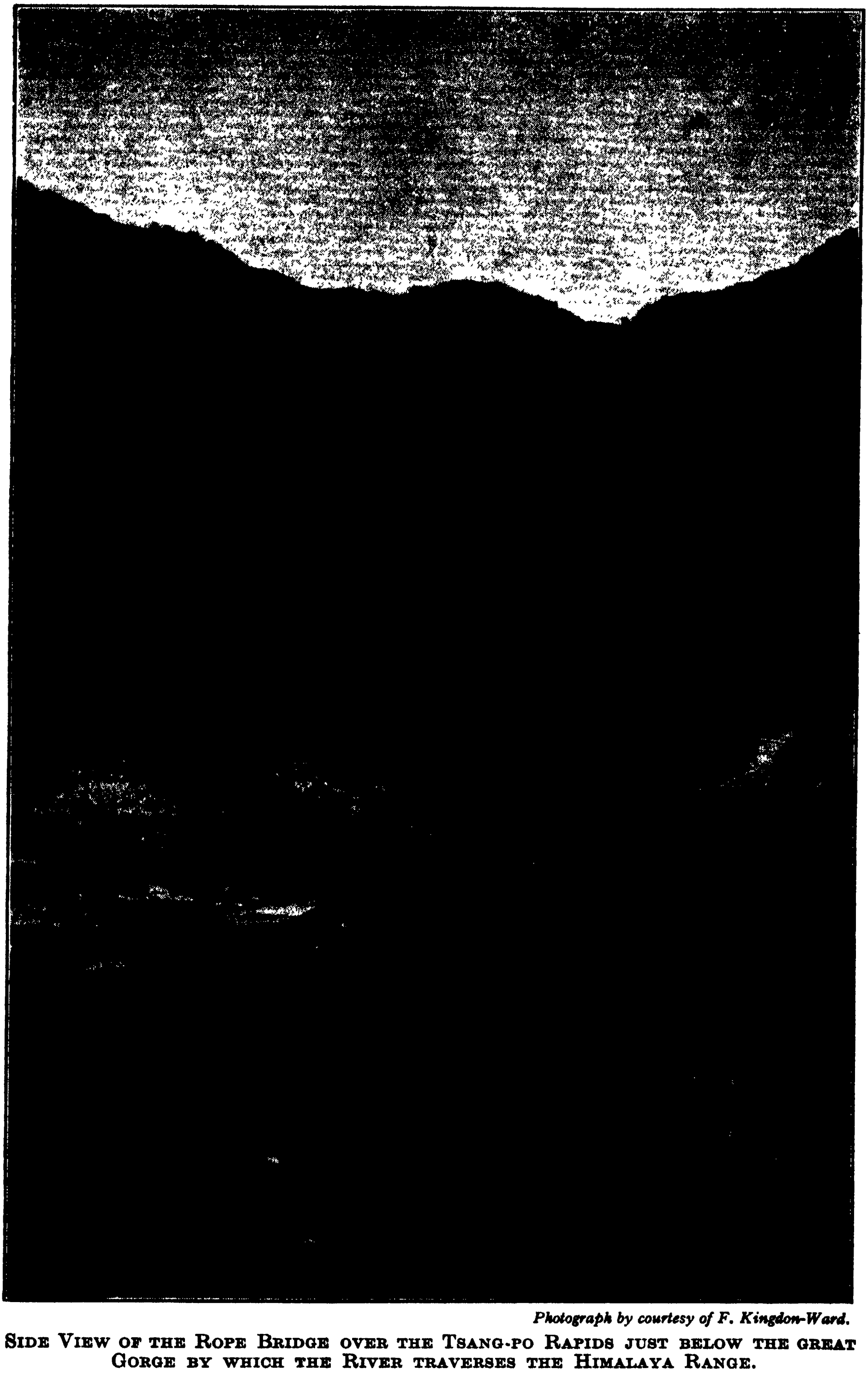
The Tsang-po, which is three miles across near Lhasa, is here squeezed into a gorge hardly fifty feet across. The gorge is about 5000 feet deep and impassable.



Photograph by courtesy of F. Kingdon-Ward.

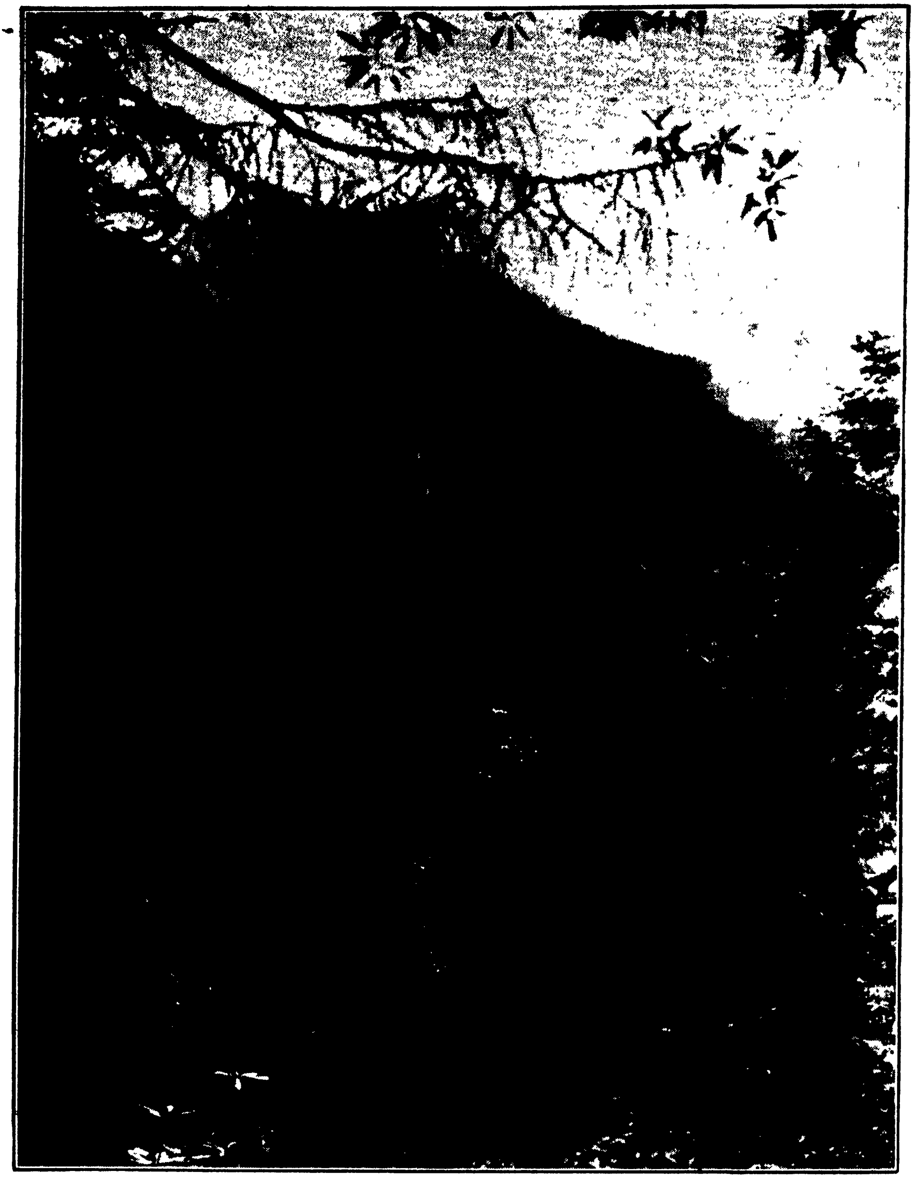
BAMBOO ROPE "BRIDGE" ACROSS THE TSANG-PO-BRAHMAPUTRA IN TIBET.

The rope is made of twisted strands of bamboo. A wooden slider, in the form of a half-cylinder, moves on top of the rope, and men are suspended from this slider by leather thongs, and so hauled across the river on a long line. The men on the rock are seen hauling on the line, and the passenger is seen suspended from the slider.



Photograph by courtesy of F. Kingdon-Ward.

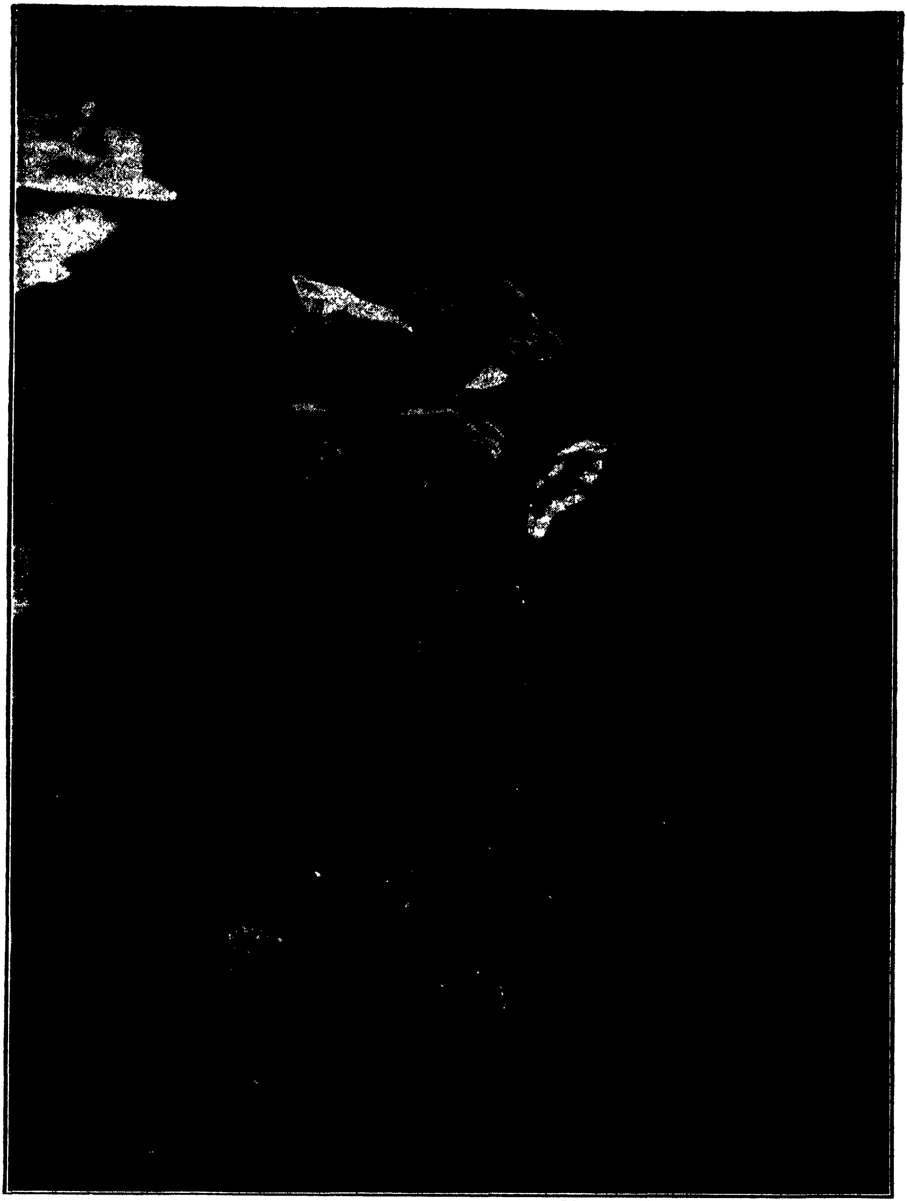
SIDE VIEW OF THE ROPE BRIDGE OVER THE TSANG-PO RAPIDS JUST BELOW THE GREAT GORGE BY WHICH THE RIVER TRAVERSES THE HIMALAYA RANGE.



Photograph by courtesy of F. Kingdon-Ward.

TEMPERATE RAIN FOREST ON THE ASSAM–TIBET FRONTIER AT 9000 FEET ALTITUDE.

The forest consists of evergreen and deciduous trees. There are many Rhododendrons, some of which grow at the tops of the big trees, like Orchids; one such is seen in the middle foreground.



Photograph by courtesy of F. Kingdon-Ward.

MECONOPSIS VIOLACEA, A VIOLET POPPY GROWING IN THE ALPINE MEADOW NEAR THE SOURCES OF THE IRRAWADDY AT 11,000 FEET ALTITUDE.

It is a near relation of the Tibetan Blue Poppy. The flowers are like silk, and five inches across.

Photograph by courtesy of F. Kingdon-Ward.

TAMAI RIVER, ONE OF THE HEADWATER STREAMS OF THE IRRAWADDY, ABOUT 1300 MILES FROM THE SEA.

The mountains are very steep, covered with dense forest (" hill jungle "). This region is very sparsely populated by uncultured tribes, who live partly by hunting. The snowy ranges of Tibet are seen in the distance.

five outside lines, one line direct to the Bloomsbury Departments of the British Museum, and other special lines, and is attended day and night, so that the building retains telephonic communication with outside points, ensuring that proper warding is possible and greater safety from fire or accident obtained. The average daily number of calls is three hundred and fifty, although larger numbers have been recorded over certain periods. A few years ago, when the crossword craze swept over this country like an epidemic, there were large numbers of persons who thought of the Natural History Museum as the solver's great friend, and who found it easier to telephone to the Museum than to worry out names of beasts or plants beginning with so-and-so and ending with something-or-other. This attitude was speedily discouraged, but while it lasted the inquiry Departments of the Museum broke records. The switchboard, though in general practice used by a single operator, is suitable for use by two. In general shape (Fig. 3) it is some-

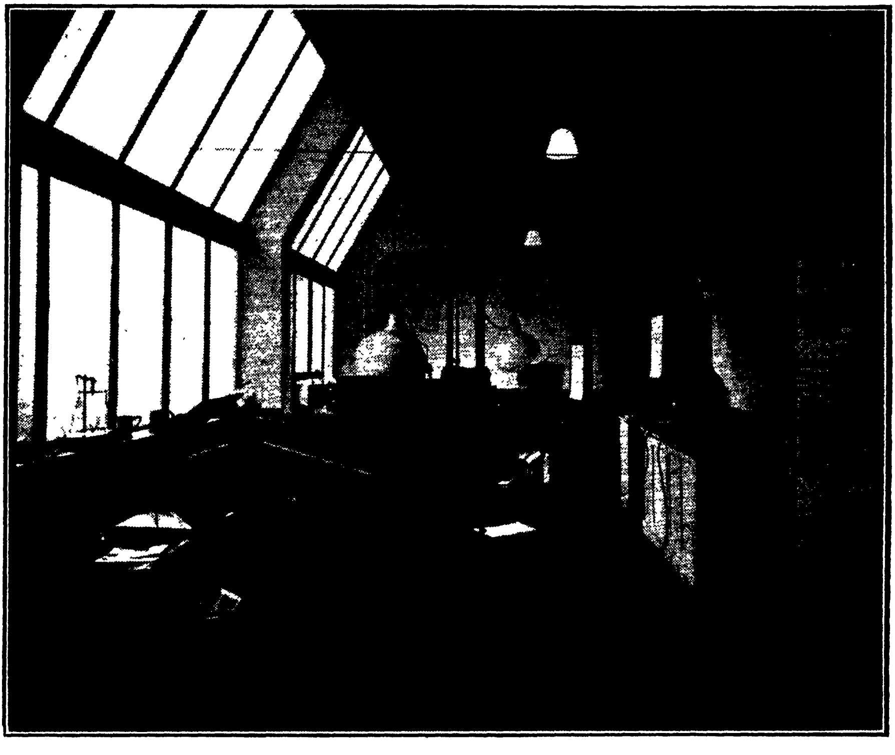


FIG. 2.—PHOTOGRAPHIC STUDIO.

what like a small upright piano. The upright part facing the operator contains the " bull's-eyes " with numbered shutters, while the horizontal part contains the ringing and speaking switches and other little bull's-eye openings with white shutters. Between the two are the connexions for the plugs. When a receiver is lifted, the caller's number appears in the bull's-eye on the upright part of the switchboard, and attracts the operator's attention, so that she asks for the number required as soon as she is free to do so. It often happens that many numbers are on the board at one time and the callers must be dealt with in sequence, as obviously they cannot all have their calls given them at the same time. The ensuing delay, in no way the fault of the operator, often results in the caller waggling the receiver hook, which means that the operator cannot possibly hear anything said and, in the case of the automatic telephone, immediately cuts off the connexion but registers a call which is charged for. The only excuse for giving this elementary piece of information is that so many telephone users have this habit, which produces precisely that result that they are trying to avoid.

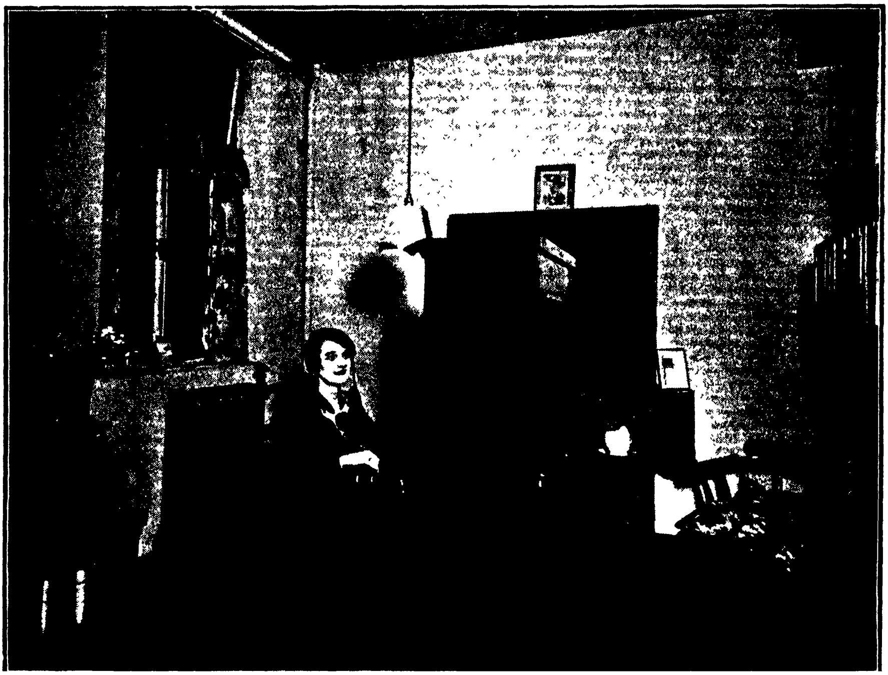


FIG. 3.—TELEPHONE EXCHANGE.

When the operator knows the number desired, she takes one of the twin plugs, inserts it into the desired connexion, and presses the ringing key for a moment or so. The connexion is thus made and communication can take place. During the call two white discs appear in the bull's-eye windows associated with the connexion plugs on the horizontal part of the switchboard, so that the operator knows the numbers are still conversing. When the white discs disappear, she knows the call is over and accordingly pulls out the plugs. The procedure in the Museum is no different from that elsewhere, but, as the telephone is such an important unit in our organization and so helpful to Staff and public alike, it may be of interest to detail its ordinary operation.

Publicity is another function of the Office, and museums are not so inadequately advertised as one might suppose. Press notices, advertisements concerning publications and exhibits for posters, newspapers, and journals have all to be prepared, in addition to the routine work of preparing statistics, formulating reports and the hundred and one duties and problems associated with the administration of a government department containing several hundred different personalities.

The duties of the large maintenance staff, which also comes under the control of the Office, will be dealt with in the next article. Meantime, perhaps enough has been said to show that the Office of the Natural History Museum is as fully occupied and efficiently and economically run as the most tax-ridden member of the general public can desire.

THE SOUTHERN SEA-LION.

By J. E. Hamilton, M.Sc., Zoologist, "Discovery" Investigations.

Although the Southern Sea-Lion (*Otaria byronia*) has been known for about 350 years, and has been familiar to a very great number of people in that time, no complete and connected account of its habits and life-history has ever been written, and even descriptions of its physical appearance are inadequate.

This animal is one of the Eared Seals, the family which includes Sea-Lions and Fur-Seals. The Eared Seals are distributed around the entire globe in the sub-antarctic regions, and occur also on the Australian coasts, up the west side of South America, and on the Pacific coast of North America from California to the Bering Sea, across which they extend to the north-east of Asia. The Fur-Seals are far better known than the Sea-Lions, from which they principally differ by the possession of the lovely coat of soft underfur, which has brought them into publicity, romance, and death. The Sea-Lions occur in smaller numbers, and, being merely oil-producing animals, have not been so assiduously persecuted; their history, what one can pick up of it, is less the tale of lost rookeries than is that of their more valuable relatives.

Realizing the serious deficiency that existed in our knowledge of these animals, the "Discovery" Committee detailed me to attempt to fill it up. The Falkland Islands are a focus of population for the Southern Sea-Lion; so I was sent there.

The investigations necessitated a great deal of riding round the islands, since some rookeries can only be approached from the landward side, on account of their positions on exposed beaches, and entailed camping as near as possible to the animals for weeks at a time. "As near as possible" means about five minutes' walk for a man and perhaps fifteen minutes for the sea-lion, who takes frequent rests; at times the animals did come over and go to sleep on the camping-ground. One thus became positively intimate with the species.

The Southern Sea-Lion is one of the largest of its race. The full-grown male is about 8 feet long from the tip of the nose to the end of the tail, and, when they trail behind him, the hind flippers will extend another 2 feet or so. The shoulders, neck, and head are greatly developed, and are so enormously muscular that the animal looks as if the fore-flippers were about the middle of its length, while the hind-quarters look ridiculously small and light compared with the front part of the body. The neck is covered with rather long, bristly hair, which gives it a peculiarly shaggy appearance. Combined with the deep and powerful voice, this character has gained for the animal its popular name, which was in the earlier days shared by the Elephant Seal. The colour of the male varies greatly; it may be almost black with a slightly lighter mane, dark brown all over, dark brown with a mane which is almost straw coloured, an almost greenish grey with the same light mane, and I have seen one specimen which was an extremely pale buff, almost cream colour over the whole of the body, neck, and head. The females are much smaller, being about 6 feet in length, and, although possessors of long and flexible necks, they are completely without the massive development of those parts which makes the males so imposing; their variations in colour nearly correspond with those of the bulls. It may be remarked here that, in accordance with the vocabulary of bygone sealers, the male is a " bull," the female a " cow," and the young, rather surprisingly, a " pup." The pup is a blackish chocolate-brown at birth, but at the end of the first year has usually become a dull brownish-yellow, which soon turns to a reddish-brown, the characteristic colour of the immature seal. In young seals colour variations are not noticeable, but with advancing age the general tendency is to lose the reddish tinge and, for the males at least, to become darker.

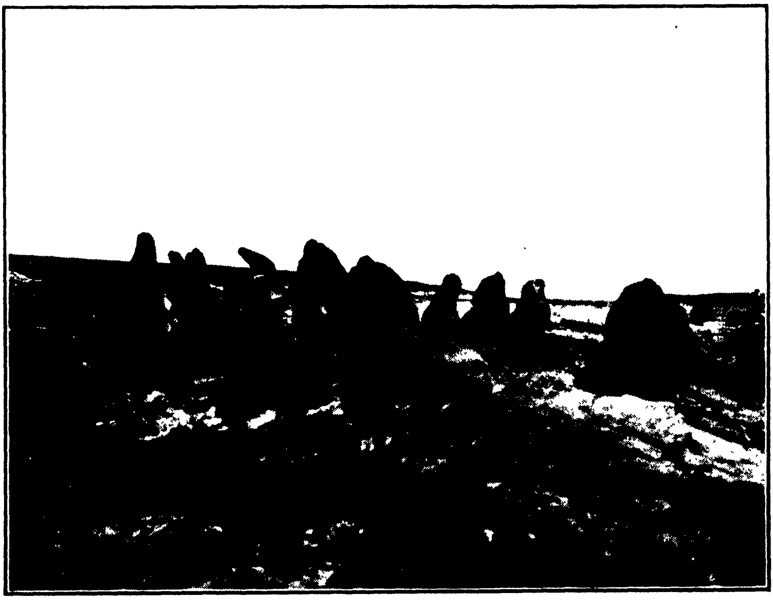


FIG. 1.—TAMAR PASS, WEST FALKLAND.

Part of a breeding rookery, showing males, females, and pups, on flat rock.

The sea-lions are generally found on the beaches, which are of two kinds : those at the foot of cliffs, and those on the seaward side of belts of the tussock grass (*Poa flabellata*), which grows luxuriantly on numerous islands, where the sheep have not been able to destroy it. At such places the edge of the land is usually sloping, and the sea-lions can easily climb up and find comfortable places where they can sleep completely sheltered from the furious winds of the Falklands. It has at times happened that I have been compelled to walk over and through tussock where sea-lions were known to be, and there is a distinct element of excitement in this, since the grass may be well above one's head and tangles before one's face, so that it is impossible to tell if the next step will flush an infuriated bull or only a harmless pup, which will rush off bleating with terror. Some of the cliff-foot beaches are not really worthy of the name, being composed of aggregations of huge blocks of rock which have fallen from the cliff above, and lie in tumbled masses dipping down to the water. Although such places are almost completely exposed to the sea, sea-lions will choose them for rookeries, although it is impossible to see where they can land in a strong on-shore wind. It seems not unlikely that the thick coat of blubber may act as a defence against a battering by the waves as well as against the bite of the chilly water.

FIG. 2.—CAPE MEREDITH, WEST FALKLAND.
A rookery on cliff talus; even in life the sea-lions can be picked out only with difficulty.

On the whole, however, the sites selected for breeding have some sort of off-shore protection in the form of rocks or perhaps beds of the huge kelp of the Southern Ocean (*Macrocystis*), which spreads its fronds on the surface of the water and effectually damps the breakers of all except the worst gales. There is no particular preference for one sort of surface or another; shingle, boulders or flat rocks seem to meet with uniform approval.

Among the Eared Seals polygamy is the rule, and our species is no exception. It is the aim and pride of a bull to secure as many cows as possible, and, since the sexes exist in about equal numbers, there are clearly not enough cows to go round with this system, with the result that during the whole breeding season there are in progress continuous and savage struggles for supremacy. Each bull picks a place on the beach where he intends to form his harem, and there he remains, waiting for the cows to collect around him. As they do so, neighbouring bulls attempt to seduce them from their allegiance, but meet at once with resistance from the lawful proprietor, and the result is rather like a dog-fight on an imperial scale, the two bulls involved dancing backwards and forwards in front of one another, sparring for an opening, snarling and snapping so that one can hear the great teeth clash together when a bite is missed, or fended by the jaw of the opponent. Very often the fight gets no farther, but if by chance one does gain a hold, he keeps it, and, when both combatants find a grip, they start using their weight, and it is then a case of the heaviest bull winning. Eventually one gives way and, turning, flees as fast as possible, pursued by his infuriated enemy, who often tries to inflict further damage on the thin skin behind the front flipper. Every bull within biting distance has a snap as the conquered one retires, but his principal antagonist does not chase him far, lest another poacher arrive on the scene. The harems vary from one cow to ten or twelve cows in number, but those which contain only one are in the minority. The sea-lion is a very gregarious creature, and at all seasons of the year is fond of living in crowds. When the breeding season comes in the summer, it does not abandon the custom, with the result that the harems are all crowded together on the beaches, and it is often impossible to say where one begins

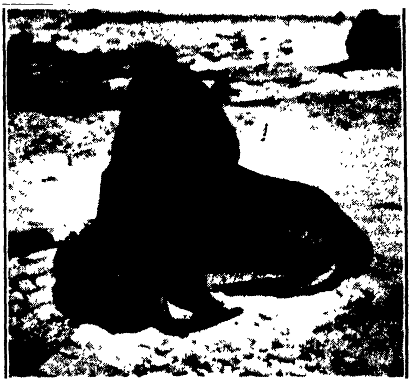


FIG. 3.—TAMAR PASS, WEST FALKLAND.
An adult male with cow at the beginning of the breeding season.

and the other ends. Only the bulls, sultans as they are, know well, and they discourage exploration by their own cows or by the neighbouring bulls.

Nothing takes place on the rookeries without snarls and roars and grunts, so that the entire area, occupied by a breeding herd. is in a constant state of uproar day and night; when it is considered that a thousand seals or so may be collected on a stretch of beach half a mile long, the noise may be better imagined than described.

Fig. 4.—Cape Dolphin, East Falkland.

Part of a rookery towards the end of the breeding season, showing sea-lions near the water's edge. The adult male in the foreground shows the thinness characteristic of the end of the breeding season.

The pups are born in the southern summer, from about the end of December to the end of January, and from a very early age are tolerably active little creatures. Since the mothers spend a good deal of their time feeding at sea, the young exhibit their gregarious nature by herding together in what are technically termed "pods," which may number several score towards the end of the season. They spend their time sleeping and playing about, either with one another, when, as might be expected, the play takes the form of mock fighting, or in solitary games with pieces of stick or seaweed found on the beach. They soon find their way to the water's edge and pools left by the tide, and there the games vary, being in the nature of aquatic gymnastics, as a result of which they learn the rudiments of swimming, but they do not venture into deep water, contenting themselves with places where they can see the bottom with ease. The cows find it necessary to teach the pups to dive; one can observe a cow inveigling her pup away from the water's edge into the deeper part, and the pup swimming like a dog after her, its head well up and the little flippers going hard. When the two arrive at a suitable place, the cow begins to play with the pup and encourages it to play with her, swimming round and round, and making shallow dives in the endeavour to persuade the pup to follow. Often the pup tires or gets frightened, and tries to climb on to his mother's back, but she slips away from underneath and leaves him to support himself: the truth is that the agility and elegance which distinguish the movements of the sea-lion in the water are learned only by continual practice, while the ability to swim downwards—that is, to dive—is acquired only with some difficulty. This lack of an inherent power to swim well affords a contrast between the sea-lion and such a representative of the True (earless) Seals as the Elephant Seal, a species in which the cow leaves her pup after a very short time and it has to swim

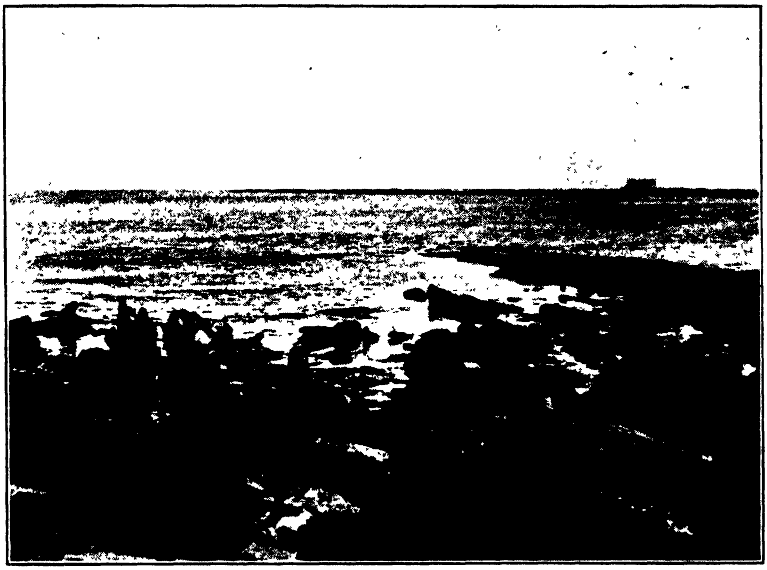


FIG. 5.—LOW ISLAND, WEST FALKLAND.

At the end of the breeding season all the animals are willing to enter the water. In the picture there is a small pod of pups in the foreground, and behind them an adult male which is beginning to go down to the water.

without the least help from the start. It may be opportune to remind the reader that the True Seal has gone much farther from the life of the four-footed animal than the Eared Seal, which can still use all its four feet to stand upon and, when ashore, can walk on them like any terrestrial animal. The True Seal, of course, is unable to stand on its feet, and crawls on the ground like a slug.

The cow suckles the pup for a period of uncertain length, which may even extend to the subsequent breeding season, nearly a year, but at the end of five months the pup is already beginning to eat solid food, the taste for which it acquires, I believe, as the result of its habit of playing with loose objects on the beach or in the water. It is certain that the stomach contents of the pups are such as would result from this method, as they comprise such things as bottom-living crustacea and ascidians, which do not form part of the food of the older sea-lions, as well as the remains of *Munida,* which is an important foodstuff at all later stages in the life of the animals. When the next pup is born, the older one usually leaves the mother—but not, I am inclined to think, invariably—and joins the general crowd of immature seal.

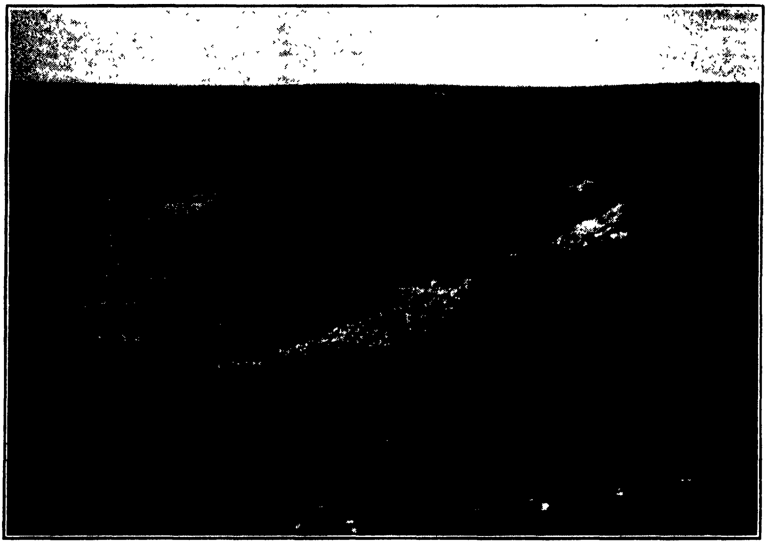


FIG. 6.—CAPE DOLPHIN, EAST FALKLAND.
Spare males on a pebble beach.

I have spoken of the breeding herd, but not yet of the non-breeding herd. On some part of the beach usually somewhat separated from the breeding seal are the haunts of the non-breeding seal, and there are found also many of the spare bulls, which seem to have given up all hope of securing cows, for the time being at any rate. The sea-lion takes about six years to arrive at its adult state, so that the non-breeding herd consists of a very varied assortment of animals, males and females of different ages, and except in the later stages very much alike in appearance, but the females are on the whole rather slighter than the males, and are more likely to have pale markings about the head. These non-breeders are much more easily stampeded than the breeding cows, and an incautious movement on the part of the observer will send a herd of hundreds galloping down to the sea amid a chorus of cries, and, if the ground be clayey, in the midst of a thick cloud of dust. On arriving at the water, the animals charge into it and swim out some distance before they look round to see what frightened the individual which gave the alarm. This is always the way : the panic of one seal will affect the whole crowd. The appearance of a strange object on the water may have a very different effect. On the arrival of a boat at places where lions have not been molested, I have seen them come down from the shore in numbers, and the boat was soon surrounded by a crowd of inquisitive, gambolling animals, playing round and

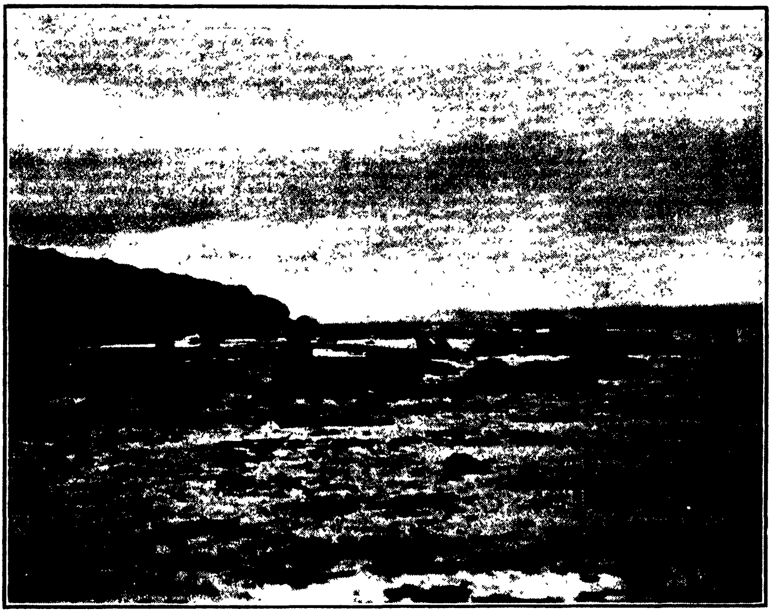


FIG. 7.—ELEPHANT CAYS, EAST FALKLAND.

Spare males on the sandy beach of an island covered with tussock grass.

under it, and poking their heads above the water to have a good stare and sniff at the strange object.

The sea-lion seems to have almost no natural enemies. That terror of the Bering Sea, where it destroys many fur-seals, the Killer Whale, is very rare round the Falklands, and the Leopard Seal, which will on occasions eat pups and perhaps older sea-lions, is definitely scarce in the islands, which are in actual fact too far north to be much frequented by the species. A strongylid worm is perhaps the most deadly foe, since it is probably the cause of death in a considerable number of pups, but starvation due to the mothers losing them may well be a more important factor. But if nature has not provided a means of keeping the numbers down, man has done his best. For many years the Falklands were frequented by sealers and whalers of the old style, whose one object was to fill the ships, and thus fur-seals were almost exterminated and the oil-producing animals, elephant-seals and sea-lions, suffered greatly, the former being reduced to such a degree that the occurrence of an elephant-seal was something to remark. Of late, I am glad to say, this species has increased in number; it might be suggested that this is the result of the increase of the numbers in South Georgia, but of this

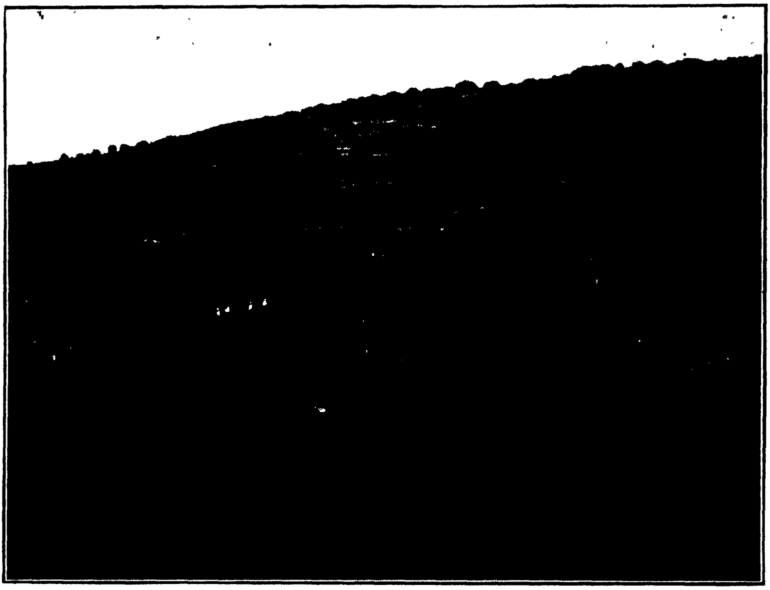


FIG. 8.—CAPE MEREDITH, WEST FALKLAND.

The ground was formerly covered with tussock grass, but except for the large tufts has been denuded of it by the sea-lions.

there can be no certainty at present. The sea-lion was never brought so low as the other two species named, and although local sealing business was carried on in a small way for many years after sealing and whaling voyages stopped, that also ceased some considerable time ago.

It is still possible here and there to find places and numbers of bones where the sealers put up their try pots, and I have even found one of the lances with which they killed the seals. This consisted of an iron shaft about 30 inches long, with a flat blade about 4 inches long by 2½ inches wide. I must say that I admire the courage of the men who would walk up to a bull seal and attack him with such a weapon; it should be remembered that the sea-lion is capable of exceedingly quick movements and is a creature of immense strength. I have seen a bull lift a full-grown cow in his jaws in spite of her struggles and bites, and the cow probably weighed three or four hundred pounds.

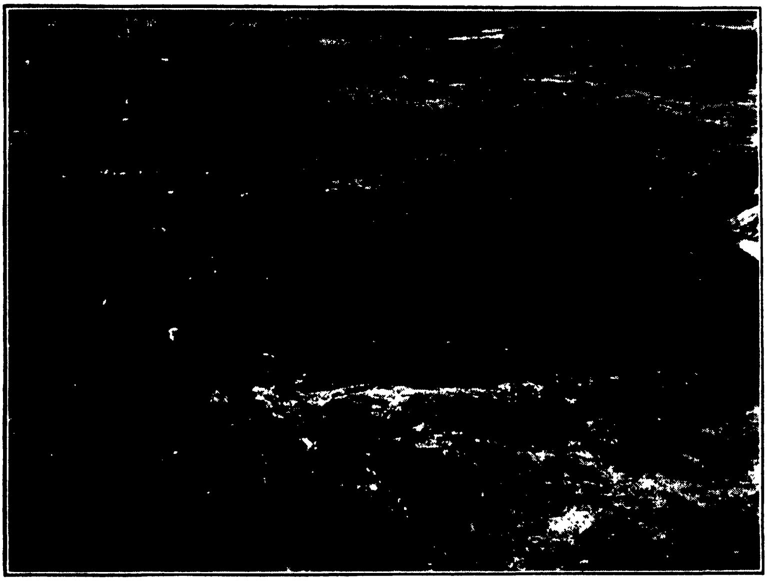


Fig. 9.—Cape Meredith, West Falkland.

Sea-lions in the water, as seen commonly all the year round.

Of late years some attempt has been made to develop a sea-lion oil industry, but among other factors the low price of oil has done much to prevent success; this new sealing confined its killing of sea-lions to the bulls, of which, as can readily be appreciated, there is a vast excess, due to the equality of the birth-rate of the sexes and the polygamy of the males. The killing of superfluous bulls would undoubtedly benefit the herd, and should actually encourage its increase by reducing the disturbances in the breeding rookeries, which must result in the deaths of numbers of pups due to their being trampled down, while the pestering of the spare bulls may prevent cows from returning to the places where they left their pups.

It may be opportune to state that this imposing species occurs in the Falklands in very large numbers, and is most strictly protected by the Colonial Government, all killing being done under licence and with the proviso that a detailed report of the killings be made. Under the present conditions the herd must inevitably increase until it reaches the saturation point for the Falkland Islands, which point is still so far off as to require no consideration at present.

A NEW EXHIBIT OF IGUANODON.

By W. E. Swinton, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

Any new exhibit of one of the larger fossil vertebrates must be of interest, partly on account of the rarity of such remains, especially in anything approaching a complete state, and partly because of the long process of development and the methods of preservation and mounting which are involved in its display. On these grounds the mounted skeleton of *Iguanodon* (Fig. 1), which has just been placed on exhibition in the Dinosaur Gallery of the Museum, merits at least a short note.

In 1914, the nearly entire skeleton of a large fossil reptile was discovered in the Wealden Shales, after a fall of cliff near Atherfield, in Brightstone Bay, on the south-west coast of the Isle of Wight. Owing to the condition of the skull bones it was recognized as a young individual, and preliminary investigation quite naturally suggested that it belonged to the species *Iguanodon bernissartensis*, so well known as a result of the discovery, in 1878, of the remains of numerous individuals at Bernissart, near Mons, in Belgium. The finder of the fossilized skeleton was Mr. Reginald W. Hooley, a Winchester business man, who was an assiduous and careful collector of fossils, and an excellent example of the type of amateur geologist and palæontologist who has done so much for science in this country. The skeleton was developed with great skill from the matrix by Mr. Hooley himself, and his discovery of it and of the remains of integument preserved upon it was published in the *Geological Magazine* for April 1917. For some years he continued the slow and laborious task of developing the bones out of the matrix, studying and describing them, and his important studies were completed in 1924 just before he died as the result of a surgical operation. His paper, however, was read before the Geological Society, and published in 1925.*

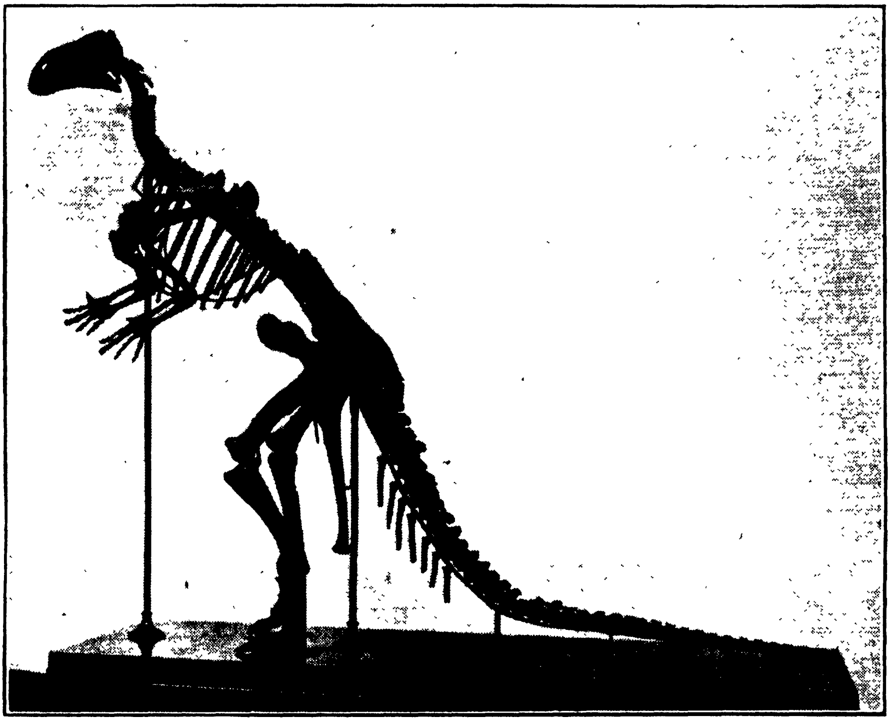


FIG. 1.—MOUNTED SKELETON OF *Iguanodon*.

This paper gives such an adequate and detailed account of the whole specimen that any further description is unnecessary. Mr. Hooley's examination proved that the skeleton could not be assigned to the species *Iguanodon bernissartensis*, as he had previously assumed, nor, indeed, to any other described by that time, and so it was made the type of a new species, named after its place of origin, *Iguanodon atherfieldensis*. In the characters

* *Quarterly Journal of the Geological Society*, 1925, vol. lxxxi, pt. i, pp. 1–61.

of the skull and other parts of the skeleton this species is intermediate between *Iguanodon bernissartensis* and *Iguanodon mantelli*, both of which are found in the Wealden of Dorset, Sussex, and the Isle of Wight. In 1924 Mr. Hooley's collections were purchased by the Trustees of the British Museum, but, as the preparators were for some years fully occupied in the workshops, it was only recently that the business of mounting the specimen was begun. The bones were first of all sorted out according to Hooley's description, and those that required further cleaning or repair were attended to. In some cases missing parts were modelled in plaster, and the last vertebræ of the tail were all prepared in this way, but it should be emphasized that the amount of plaster work is relatively small and each part of it was modelled upon some similar bone in the skeleton. The important but laborious process of mounting the bones for exhibition presented some difficulty. The bones are heavy; for example, the three-feet-long thigh-bones each weigh 37½ lb., so that obviously a structure of some stability had to be erected for their support; further, such an iron mount must be shaped to fit the bones if it is to give adequate support and be as unobtrusive as possible. The iron-work was entrusted to the Museum smith, but so frequent were the calls upon his services from other quarters that it was unfair to expect continuous service on his part. Fortunately, Dr. C. T. Trechmann came to hear of the difficulty and generously provided the funds for the temporary employment of a smith. The work was then able to proceed without interruption. The bone and plaster additions were then mounted to the iron-work in such a way that every important member of the skeleton is readily detachable for study. As the skeleton is not under glass-protection, the hardening of the bones was important, and a solution of amber shellac was applied until the whole is now adequately protected. The plaster-work was painted in colour approximating to that of the bones, but the distinction is readily apparent. The work of repairing, modelling, preserving, and mounting was done with great skill by Mr. L. E. Parsons, Technical Assistant in the Department of Geology, and the resulting exhibit is very effective.

The length of the skeleton from the tip of the snout to the tip of the tail is 16 feet, which may be compared with the 34 feet of some of the large Iguanodons.

In life these creatures were herbivorous, feeding upon the trees and shrubs of the early Cretaceous period, and no doubt digging off branches or fronds with their spike-like thumbs. As most browsing types of animals living to-day avoid the kinds of plants most akin to those of the Wealden flora, it is difficult to know what particular plants the Iguanodons would eat. The teeth are well adapted for a browsing habit; in the front of the jaws, however, there are no teeth, but instead a horny beak.

Iguanodon was bipedal, though probably it occasionally rested upon all-fours. It may have been a moderately swift runner when pursued, as it must have been by the contemporary preying dinosaurs. The skin was unarmoured, and this particular specimen has traces of it remaining which are instructive. It is remarkable for its thinness and its covering of small tubercles, a condition which was continued even on the skin between the fingers. In addition to these small tubercles various parts of the body integument were ornamented by groups of polygonal plates, of about one inch in diameter. Nothing, of course, is known about the colour of the skin.

The exhibit should prove attractive to the public; not only because it is an unusually fine skeleton and well mounted, but also because of its English, and almost local, origin.

BRITISH FRESHWATER INSECTS SCENE.

By D. E. Kimmins, Unofficial Scientific Worker, Department of Entomology.

A scene (Fig. 1) illustrating British Freshwater Insects has recently been installed in the Insect Gallery. The scene is a country district in the Midlands during the month of June, and in the foreground is a corner of a pond, around the margin of which are a few characteristic plants such as yellow iris, sedge, forget-me-nots, and rushes. In the middle distance can be seen a slowly-flowing river, bordered by yellow iris and purple loosestrife. The exhibit itself is divided into two parts at the level of the water, so that the visitor can view the general scene and then study the life in the pond.

In the upper part of the case are dragon-flies (*Odonata*) in flight and at rest, caddis-flies (*Trichoptera*), pond skaters (*Hemiptera*), flies (*Diptera*), and beetles (*Coleoptera*). The dragon-flies include examples of the big *Anax imperator*, flying high over the pond, male and female of the broad-bodied Libellula (*Libellula depressa*), the two common blue damsel-flies (*Agrion puella*), and *Ischnura elegans*, and also the scarlet *Pyrrhosoma nymphula*. A female of the latter species is shown ovipositing on a potamogeton leaf, whilst the male remains in attendance, clasping the prothorax of the female with his anal appendages, and balancing himself vertically over the female. Fluttering over the margin on the right are examples of *Calopteryx splendens*, the nymphs of which occur in slowly running water. Cast nymphal skins of dragon-flies are shown on the rushes and on the leaves of the yellow iris.

Settled on the stems of the rushes and of the yellow iris are caddis-flies of various species, including *Phryganea grandis*, *Limnophilus flavicornis*, and *Limnophilus sparsus*. On a leaf of potamogeton are two examples of one of the

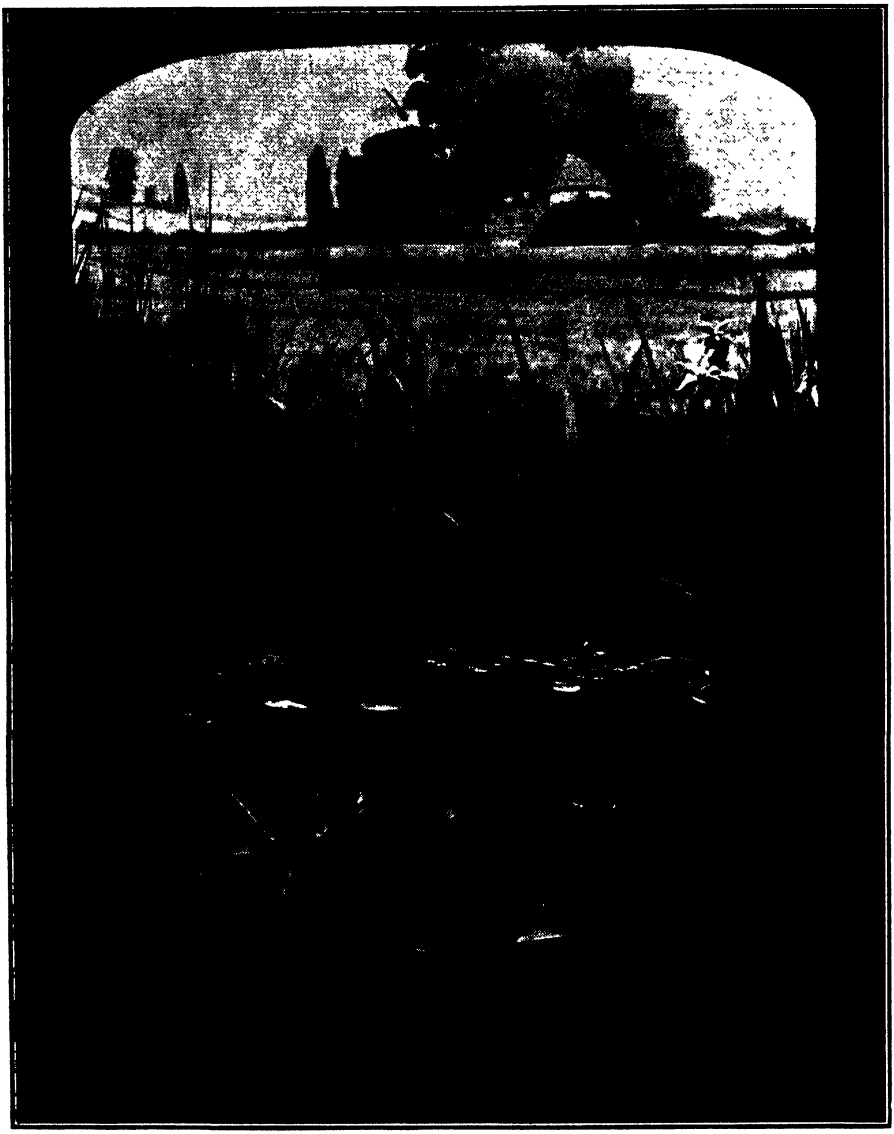


FIG. 1.—BRITISH FRESHWATER INSECTS SCENE.
View above and below the surface of the water.

long-horned caddis-flies, *Mystacides azurea*. The pond skaters on the surface of the water are represented by two species of *Gerris*, and on a floating leaf to the left are specimens of the very delicate little bug *Hydrometra stagnorum*.

Among the flies shown are hover-flies of the genera *Myiatropa* and *Helophilus*, a large daddy-long-legs with patterned wings, the larva of which lives in damp soil, a large yellow and black fly, *Stratiomys*, both larva and pupa of which are aquatic, and also the Midge, *Chironomus plumosus*.

In the under-water portion are, besides a number of plants of a potamogeton (*Potamogeton natans*), specimens of the great water beetle, *Dytiscus marginalis*, and its larva; the water boatman, *Notonecta glauca*, a water-bug which always swims on its back and carries a silvery film of air on its ventral surface; both these insects are carnivorous. Other representatives of the water-bugs include the water scorpion, *Nepa cinerea*, which hides in the mud, awaiting its prey, and *Ranatra linearis*, which hangs head downwards from the aquatic vegetation and catches insects with its mantid-like front legs. Two types of dragon-fly nymphs are shown: the elongate form, which occurs in the genera *Anax* and *Aeschna*, and the shorter, more sprawling form of the genus *Libellula*. The latter frequent the fine mud at the bottom of ponds, which adheres to the hairs that clothe them and renders them almost invisible. Both types are carnivorous and catch their prey by means of a folded, extensible "mask," which is developed on the under side of the head and is capable of being shot out when the insect is within reach of its prey. Cases of a number of different Caddis larvæ are exhibited, including the cylindrical, spirally built leaf cases of *Phryganea* and the flat leaf cases of *Glyphotœlius*.

Mr. Ernest Whatley is the artist who painted and prepared the scene.

BOOK NOTICES.

What Butterfly is that? A Guide to the Butterflies of Australia. By G. A. Waterhouse, D.Sc., F.E.S. Pp. viii + 292; 34 plates, 26 in colour. (Sydney: Angus and Robertson, 1933. 12*s*. 6*d*.)

The first twenty-three pages of this admirable book deal with general matters, classification, development, variation, distribution, etc., and the last twenty-seven contain the index and many hints on collecting. Amongst the latter there is, rather oddly placed there, a brief account (p. 269) of the relationship of the butterfly fauna to the main vegetational zones, showing how practically all the endemic species are restricted to the Sclerophyll forests along the coasts of New South Wales and Victoria. The remainder of the book is devoted to a very methodical systematic account of the butterflies, the brief description being accompanied by the known distribution and such information as is available concerning the immature stages, food-plants, etc. It is in this last category that the most noticeable advance has been made since the publication, jointly with Lyell, of Dr. Waterhouse's "Butterflies of Australia" in 1914. Indeed, although the author bemoans the numerous lacunæ, the fullness of the data on this subject is quite surprising; it is high testimony to his persistence and devotion to his subject. As already stated, the descriptions of the butterflies are brief, but, when the excellence of the coloured plates by Neville Cayley is taken into consideration, it cannot be said that they are inadequate. To many students the provision of keys for the recognition of species would have been welcome, but in a work, the appeal of which is largely popular, their absence is readily excusable. Even without a check of this kind it may confidently be said that Dr. Waterhouse will certainly achieve his main object, namely, "to enable anyone to identify readily any butterfly he is likely to see in the settled parts of Australia." The provision of popular names for the 339 species described might be deprecated by some; but, since these would inevitably be coined eventually, it is perhaps as well that it has been done at once and by a single author. The plan adopted by Brigadier Evans for the Indian butterflies has been followed, and, if it has resulted in a Tindale's Jezebel, and a Tailed Cupid, what does it matter? Of a book so concise, so up-to-date, so sound yet popular, so admirably illustrated and produced, in a sense so final in respect of its main subject, such criticisms as may be made are but trivialities.

Australian Finches in Bush and Aviary. By NEVILLE W. CAYLEY. Pp. xix + 256, with 10 plates in colour and 16 in monochrome. (Sydney: Angus and Robertson, Ltd. 1932. 12*s.* 6*d.*)

LAST year Mr. Cayley produced a very useful general book on the birds of Australia, but in the present volume he has confined himself to one particular family: the Weavers or Weaver Finches. This family is represented in Australia by nineteen species and a number of races.

Each bird is fully described and the characters by which the races can be distinguished are also given, while their distribution is shown on a series of maps. A knowledge of these subspecies is an important detail to the aviculturist, since, as the author tells us, certain races are easily kept in captivity and others are not. For instance, the form of the fire-tailed finch in Tasmania is, in a wild state, a tamer and more confiding bird than its cousin across the Bass Strait, and in captivity birds from the mainland generally die soon after capture, while those from the island live a good time. There are useful hints on construction of aviaries, and the care of different species and their ailments. A paragraph is devoted to the historical details of the discovery of the different birds most of which were originally discovered or described by Gould.

Mr. E. W. Jones contributes a chapter entitled "Among the Finches in their Natural Haunts," and has much interesting information to tell. He describes how the birds are captured by professional trappers and sent to the towns for sale. Once when motoring along a travelling stock road during great heat he noticed swarms of Weaver Finches trying to drink from cattle troughs at the roadside. The troughs were only half full and in their attempts to get at the water numbers of the birds fell in and were drowned. Mr. Jones placed pieces of wood in the troughs to help the birds but was taken to task by a stockman, who said the cattle might be frightened and that the water was for them and not for the birds.

This will be a useful book for the aviculturists and the admirable coloured drawings of the various species and subspecies will greatly facilitate identification. In addition, there are two plates depicting a number of hybrids.

Deuxième Congrès International pour la Protection de la Nature (Paris, 30 *juin–*4 *juillet* 1931). *Procès-Verbaux, Rapports et Voeux, publiés sous la direction de A. Gruvel par Charles Valois et G. Petit.* Pp. iv + 584, with 16 plates. (Paris: Société d'Éditions Géographiques, Maritimes et Coloniales. 1932.)

THIS large volume includes in full the communications made to the Second International Congress for the Protection of Nature, and also the principal speeches made at the plenary sessions. This Congress, like the First, held in 1923, took place in Paris, the venue being certain of the lecture theatres attached to the Natural History Museum. The Congress was divided into the five sections: Faune, Flore, Sol et sous-sol, Sites et Paysages, Protection générale de la Nature. Such a division was perhaps unfortunate as the several meetings were held simultaneously and delegates were necessarily often absent from discussions in which they might have been interested. The President of the Congress was Monsieur Albert Lebrun, then President of the Senate, who was subsequently elected President of the French Republic.

The various communications convey much interesting and useful information about what has been or should be done towards the protection of nature in various parts of the world; but it is far from complete or comprehensive. For instance, the position in Great Britain is not mentioned and little generally is said about conditions in the British Empire, only two such papers being presented : the one by Capt. Keith Caldwell on hunting the elephant and rhinoceros in Uganda and the other by Major R. W. G. Hingston on the African elephant and the traffic in ivory.

The principal, and possibly the only practical achievement of the Congress is the resolution in favour of a conference of the Powers interested to discuss the adoption of a convention based on the London one of 1900 for the protection of the African fauna (p. 543). This resolution arose immediately out of the letter from the British Prime Minister (p. 41), which the British Government delegates laid before the Congress.

MUSEUM NEWS.

His Royal Highness Prince George, K.G., accompanied by Major Humphrey Butler, M.C., visited the Museum on March 9.

Their Royal Highnesses the Duke and Duchess of York visited the Museum on March 27.

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The Principal Trustees have appointed Mr. F. C. Fraser and Mr. J. F. Perkins Assistant Keepers in the Departments of Zoology and Entomology respectively.

Mr. Francis Charles Fraser was educated at Dingwall Academy and at Glasgow University, where he graduated B.Sc. with second-class honours in zoology in 1924. He served as biologist with the " Discovery " Committee from 1925 until his appointment to the Museum.

Mr. John Frederick Perkins was educated at Newton College and at the Imperial College of Science, where he obtained first-class honours in the final examination in 1932.

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The Exhibition of the Game Animals of the Empire, which was opened in the new Whale Gallery on May 31 last and proved such a popular attraction, was closed on March 19. A brief description of it by its organizer, Capt. J. G. Dollman, appeared in the *Natural History Magazine*, 1932, vol. iii, pp. 239–42. The illustrated guide-book, " Game Animals of the Empire," by the same writer is still available, price sixpence.

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A scene, illustrating the life-history of British Freshwater Insects, has been installed in the Insect Gallery.

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A new unified scheme of warding, including the fire protection, came into operation on April 1. The services of police and police pensioners have been dispensed with, and all the warders are now directly employed by the Trustees. Simultaneously, the titles of the Hall Staff have been changed to Superintendent, Deputy Superintendent, and Assistant Superintendents, as they have been placed in charge of the warders.

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The series of Special Lectures on Monday mornings will be suspended during July, August, and September, and will be resumed on October 2.

ACQUISITIONS.

Department of Zoology.

A collection, of over 2500 birds and 100 mammals, made by Mr. Jack Vincent in Portuguese East Africa; presented by Rear-Admiral Hubert Lynes, C.B.

Mounted specimens of an Eritrean kudu from north-east Africa, an ocelot from South America, and a pigmy marmoset; presented by the Rowland Ward Trustees.

A collection of mammals from India; presented by Lieut.-Col. C. H. Stockley.

Skull of a bongo, with exceptionally long horns, from Ashanti; presented by Mr. Reginald C. Graves.

Skin and skull of a hybrid between a lion and a leopard, which was bred in the Gardens of Kolhapur; presented by Col. F. W. Wodehouse, C.I.E.

Skull of a lion, a man-eater which in the years 1925 and 1926 killed fifty natives from villages near the junctions of the Bua and Ruca rivers in Nyasaland; presented by Mr. R. H. Keppel-Compton.

A small collection of mammals, including a new species of golden mole belonging to the genus *Chlorotalpa*, from Tanganyika Territory; presented by Mr. W. G. Cubitt-Currie.

Collections of big game trophies; presented by Lady Wolverton, Col. J. L. F. Tweedie, D.S.O., and Major L. Payne-Gallwey.

A topi from Kenya Colony; presented by Lord Howard de Walden.

Two mounted heads of the East African buffalo; presented by Hon. John Scott-Ellis.

Skin and part of the skeleton of a manatee from Nigeria; presented by Mr. F. J. Woods.

Skins of a male and female golden cat, *Profelis aurata*, from the Cameroons; presented by Mr. F. Carpenter.

A collection of shells of land snails of the genus *Clausilia* and of the dog whelk (*Thais lapillus*); presented by the Rev. A. H. Cooke, D.D.

A St. Bernard dog; presented by Mrs. Staines, who is defraying the cost of mounting the specimen.

Welsh terrier specimen; presented by Mr. Walter S. Glynn.

A mounted specimen of a bull terrier; presented by Mrs. Snell.

Fur-seal skin, prepared to show the difference between natural, prepared, and dyed fur; presented by the Hudson's Bay Company.

Coypu or Nutria skin, prepared to show the natural fur on one half and on the other half the prepared nutria fur; presented by Messrs. P. R. Poland & Sons.

Statuette of a horse, representing the best type of hunter, the work of the donor; presented by Capt. Adrian Jones.

A valuable series of shells of the genus *Partula* illustrating the remarkable local polymorphism manifested by these land snails; received in exchange from the Museum of Comparative Zoology, Cambridge.

A specimen of the giant squid, *Architeuthis*, stranded in West Bay, Scarborough, on January 14; purchased.

Department of Entomology.

About 2500 insects of various orders collected in Perthshire by members of the staff of the Department of Entomology; presented by the Trustees of the Godman Exploration Fund.

Final instalment of the material collected by the Percy Sladen Trust Expedition to the Seychelles and other islands of the western Indian Ocean in 1905 and 1908–9; presented by the Percy Sladen Trustees.

A further selection, numbering 7773 insects, from South Africa during the past year; collected and presented by Mr. Rowland Turner.

A small collection of Caddis-flies formed at Burnt Woods, Staffordshire, by the donor; presented by Mr. H. W. Daltry.

A series of a new species of *Blepharocera*, from Mount Kina Balu, North Borneo; presented by Mr. H. M. Pendlebury.

Department of Geology.

Model of an extinct straight-tusked elephant; presented by the American Museum of Natural History, New York.

A collection of ammonites from the Bathonian beds of Antarctic Harbour, East Greenland; obtained by the expedition in 1929 under the leadership of Mr. J. M. Wordie.

A complete specimen of the ancient shark, *Hybodus hauffianus*, 7 feet long, from the Upper Lias of Holzmaden, Württemberg; purchased.

A small number of very fine fossil fishes from the Eocene beds of Monte Bolca, north Italy; purchased.

Department of Mineralogy.

A large and finely marked mass of meteoric iron, weighing 170½ lb. (77½ kg.), from the meteorite craters near Henbury, Central Australia; presented by the Kyancutta Museum, South Australia, through the Secretary, Mr. R. Bedford.

Fractured and powdered dolomite rocks from the meteorite craters of Kaali, on the island of Oesel in Estonia; presented by Mr. J. A. Reinvaldt.

A very large mass of celestine, weighing 8¼ cwt. (423 kg.), from Yate, Gloucestershire; presented by the Bristol Land & Mineral Company.

Bauxite from south France; presented by the Directors of the Union des Bauxites.

A specimen of minyulite, a new phosphate mineral, from Western Australia; presented by Dr. Edward S. Simpson.

Kolbeckine, a new mineral, from Bolivia; presented by Dr. R. Herzenberg.

Manuscripts from the collection of the Edinburgh banker and mineralogist, Thomas Allan (1777–1833); presented by Lieut.-Col. P. S. Allan, D.S.O.

Fragment of a meteoric stone, of the rare eucrite type, which fell near Chaves, Portugal, on May 3, 1925; exchanged.

Fragments of a meteoric stone, which fell near Yukan in eastern Kiangsi, China, on August 27, 1931; exchanged.

A series of tektites from French Indo-China and Tan-Hai, south China; exchanged.

New mineral species: ardealite, from Transylvania; bianchite, from Italy; cer-orthite, from Finland; purchased.

A cabochon-cut white scapolite, weighing 33½ carats, from the Ruby Mines, Upper Burma; purchased.

Department of Botany.

A further consignment of Nepal plants, which were collected in central Nepal by Prof. K. N. Sharma and presented to the King by His Highness the Maharaja of Nepal; loaned by His Majesty the King.

Herbarium of the donor's late husband, Mr. Percy Moring; presented by Mrs. Moring.

OBITUARY.

MR. B. H. SOULSBY, M.A.

MR. BASIL HARRINGTON SOULSBY died at his residence at Reading on January 14 after a short illness in his sixty-ninth year. He retired from the Office of Librarian on January 23, 1930, and an account of his career appeared in the *Natural History Magazine* (1930, vol. ii, p. 176, portrait p. 175). After his retirement he continued to give voluntary help with the preparation of the catalogue of the works of Linnæus, on which he had been engaged for some years, and, indeed, he visited the Museum shortly before Christmas. During his life he was a generous donor to the Museum Library, and at his death bequeathed to it all the Linnean material in his possession. The funeral service at All Saints Church, Reading, on January 17 was attended by Mr. A. C. Townsend, his successor as Librarian, and by Dr. W. T. Calman, Dr. W. E. Swinton, Mr. T. Wooddisse, and Dr. G. F. Herbert Smith, of the Museum Staff.

LIEUT.-COL. J. STEPHENSON, C.I.E., F.R.S.

The death of Col. J. Stephenson on February 3, almost on the eve of his sixty-second birthday, has deprived the Trustees of the services of one of the band of workers which the Museum has long been fortunate enough to attract to till the field of natural history, ever too large to be cultivated thoroughly by the permanent staff. He had under his care the little-studied group of earthworms and allied creatures. Unhappily the Museum had the benefit of his help for little more than three years.

Born on February 6, 1871, Col. Stephenson was educated at Burnley Grammar School and at Manchester University. In 1895 he entered the Indian Medical Service, and in 1906 was appointed Professor of Biology at Government College, Lahore, and of Zoology there in 1912, becoming Principal the same year; in 1918 he was Vice-Chancellor of Punjab University. On returning home, he was Lecturer in Zoology at Edinburgh University from 1920 to 1929, when he came up to London to be Editor of the " Fauna of British India " and at the same time to work at the Museum. He was elected a Fellow of the Royal Society in 1930. At the time of his death he was Zoological Secretary of the Linnean Society.

At the funeral at Kensal Green Cemetery on February 6 the Museum was represented by Dr. W. T. Calman, Mr. J. Ramsbottom, Mr. G. C. Robson, Mr. N. B. Kinnear, Mr. C. C. A. Monro, and Dr. G. F. Herbert Smith.

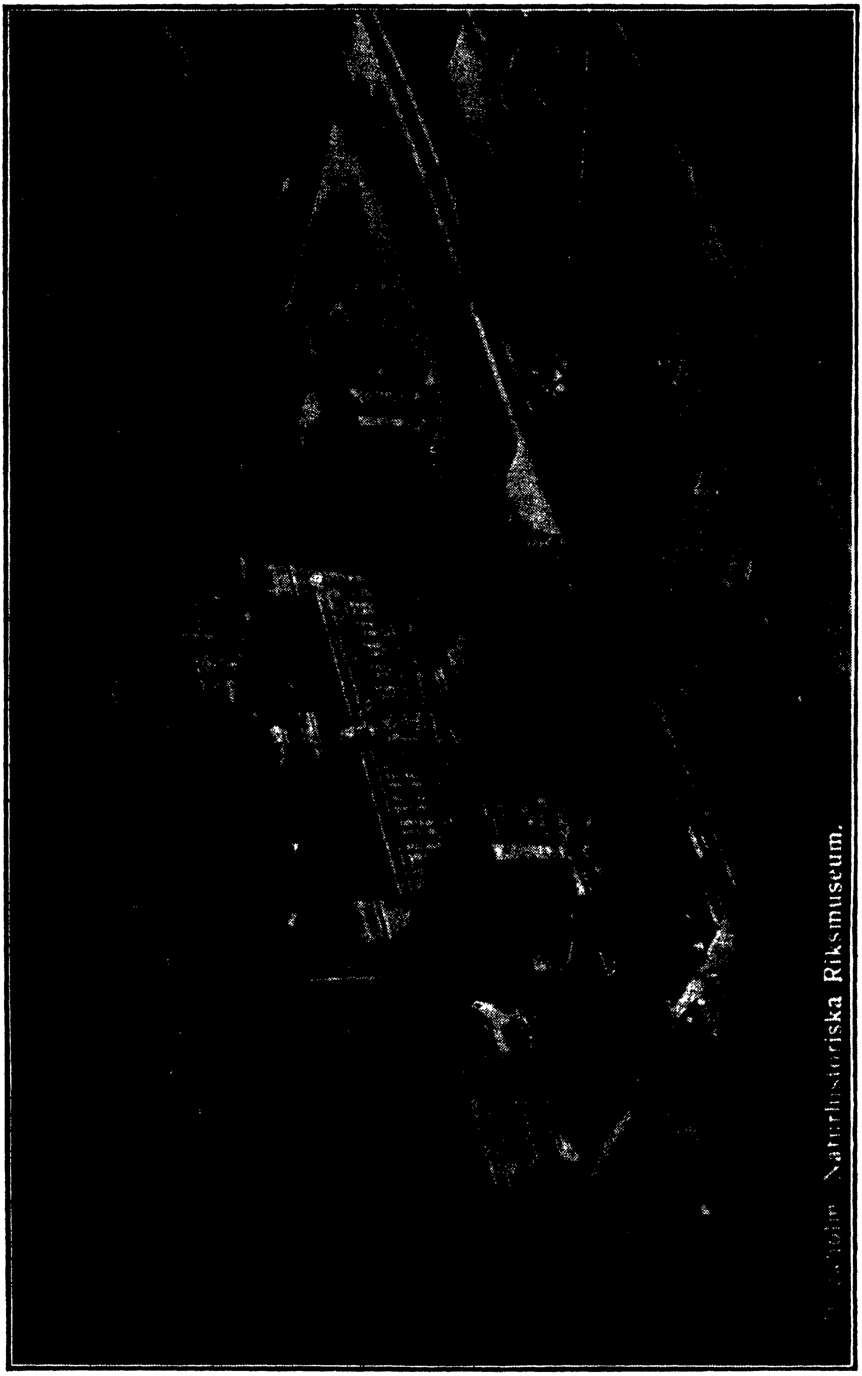
Natural History Magazine

No. 27 JULY, 1933 Vol. IV

THE NATURAL HISTORY MUSEUM (NATURHISTORISKA RIKSMUSEUM) STOCKHOLM.

By PROF. DR. EINAR LÖNNBERG, formerly Intendant of Vertebrates,
Natural History Museum, Stockholm.

AT the first meeting of the Swedish Academy of Science, on June 2, 1739, it was resolved to buy a cabinet for keeping natural history specimens; such may be said to have been the origin of the Natural History Museum at Stockholm. The first specimen received was a sponge which had been found growing on a ship, and other gifts in the first year included shells, eggs of a ray, and archaeological specimens, thus indicating the future range of the Museum or, as it was first called, the Natural History Cabinet of the Academy. At the beginning growth was slow; the additions were mainly single specimens, some merely "curiosities" as they were called at that date, but they did include some collections, either given or purchased. The old records mention collections of minerals, of insects, and of vertebrates, and herbaria. Students of Linnaeus who had travelled abroad brought back home with them natural history specimens from different parts of the world: for instance, Kalm from North America, Rolander from Surinam, and Sparrman from South Africa. The last named was employed from 1777 to 1798 as curator or demonstrator of the collections, which were exhibited in a building bought by the Academy in 1778, and at least from 1784 were open to public inspection. Considering the smallness of the funds available, the growth of the collections was quite satisfactory. As arsenical soap for preserving certain specimens—for instance, mounted birds and mammals—against the ravages of moth, was unknown at that time, many of them fell to pieces. The only method then in use was to keep the specimen in a wooden case with a glazed front. In this way many of the type specimens of "Museum Carlsonianum," which had been described by Sparrman, were eventually lost. Despite such losses the collections continued to grow, and in 1818 the Academy found it necessary to appoint

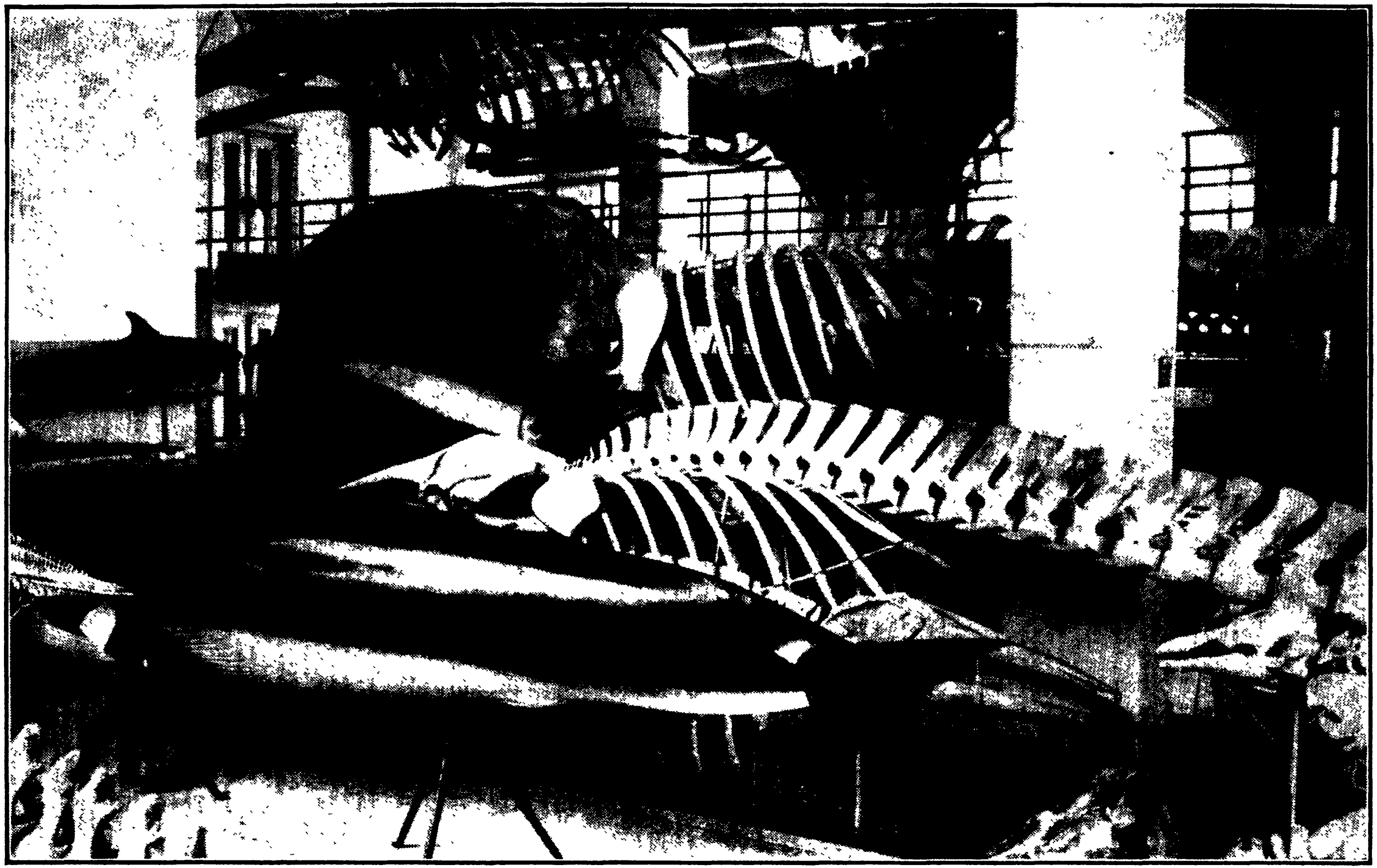


THE NATURAL HISTORY MUSEUM, STOCKHOLM.
View from the air, looking south-east.

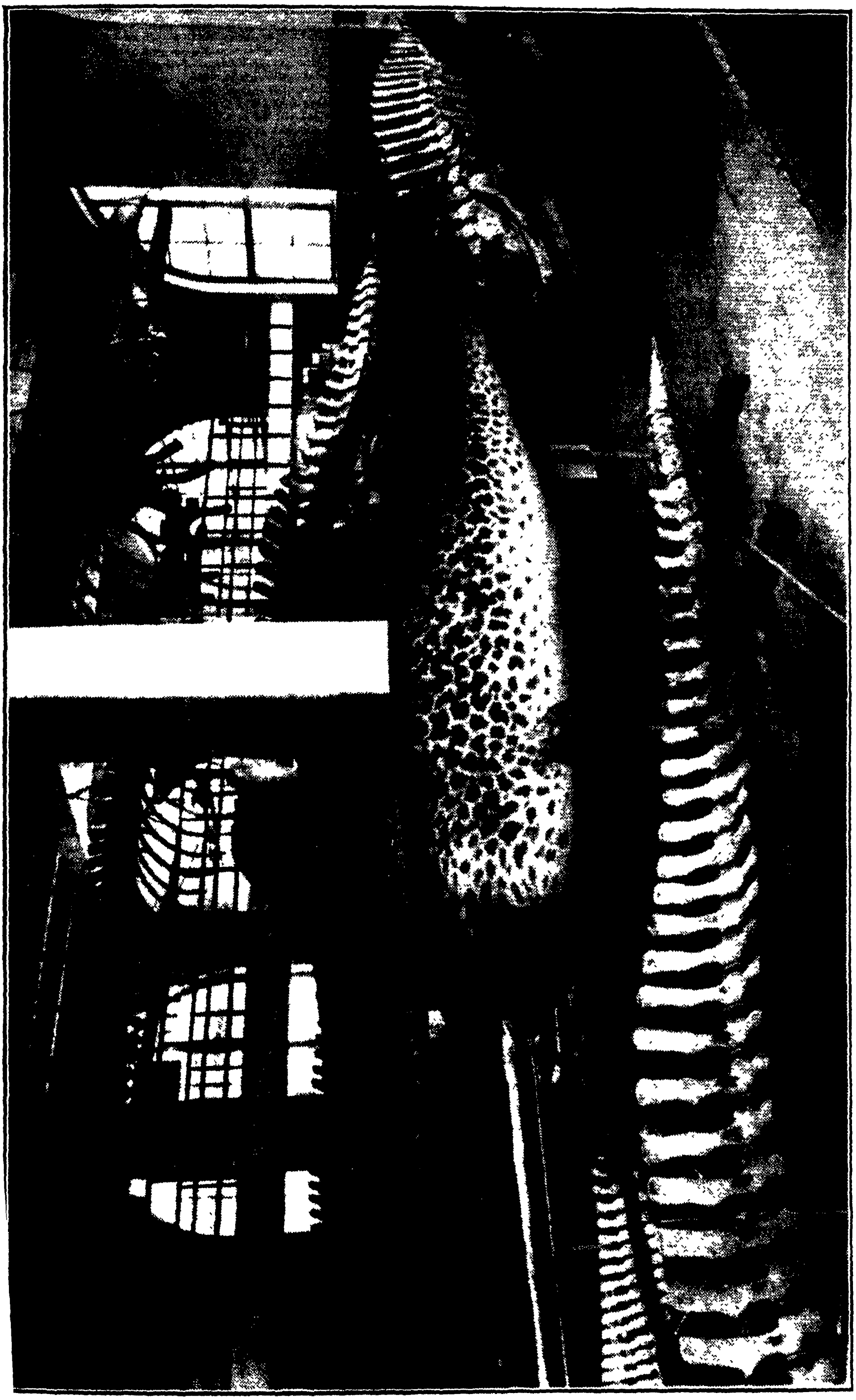
two curators, the one for the botanical and the other for the zoological and ethnographical collections.

In the following year, 1819, a great change was brought about by the efforts of Baron Gustaf Paykull. A member of the Academy, he was keenly interested in zoology, and particularly in entomology and ornithology. It may incidentally be noted that he originally established the interesting genus of wading-birds, *Dromas*, the type specimen of which still survives. A great traveller, he had visited the natural history museums of many countries, and at his estate, Vallox-Säby, about 30 miles (50 kilometres) north of Stockholm, he had formed quite a considerable zoological collection. It was he who in his later years put forward the idea that there should be a State Natural History Museum in Sweden. He submitted the proposal to King Carl XIV Johan, and at the same time offered to present, under certain conditions, the whole of his private collections to such a museum. The King viewed the proposal favourably, and, when consulting the Academy as to the best way of giving effect to it, offered a site for the Museum. The Academy was fully conscious of the importance of the establishment of such a museum for the study of natural history in Sweden and warmly supported the proposal; but, inasmuch as the sites offered by the King were not wholly suitable, it was suggested that Baron Paykull's collection should be joined together with those belonging to the Academy to form the New State Natural History Museum. This proposal was approved; and the establishment of the Riksmuseum was sanctioned by the King in a Royal letter, dated June 16, 1819. By it the Museum was committed to the care and supervision of the Royal Academy of Science, an arrangement that still continues, for the Academy constitutes itself the Board of Trustees.

As speedily as possible, Baron Paykull's collection was removed to Stockholm. The register shows that it contained 1362 birds, all in boxes with glazed covers, a very large number of insects—there were, for instance, 1422 specimens of Lepidoptera—as well as many mammals, including big ones, and various other kinds of animals. The collections in the Riksmuseum at once began to grow rapidly, and in consequence complaints were soon made that the rooms were too crowded. As early as 1823 the Academy had to place three cabinets, containing mineral specimens presented to the Museum, in the Assembly Room and two more in the Antechamber. Finally, in 1828 the Academy decided to buy a larger building for the Museum, and in the following year, after it had been put into



WHALE MUSEUM.



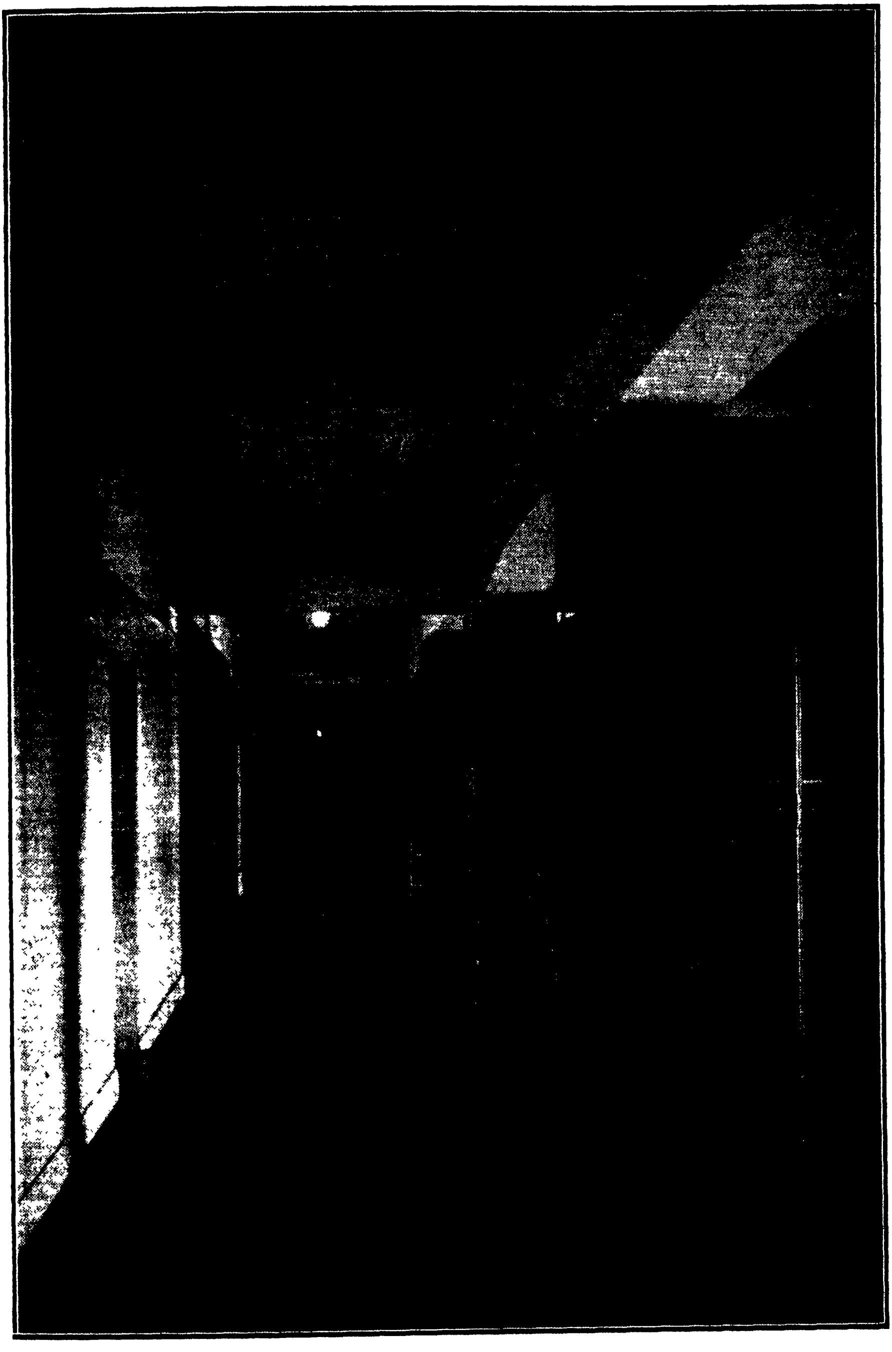
WHALE MUSEUM.

thorough repair, the collections were gradually removed to the new building. The rooms were now provided with cabinets, which replaced the boxes with glazed tops, as arsenical soap had come into use for the protection of specimens from the attack of moths, which formerly had been responsible for the loss of so many specimens. In 1830 a third department, with its own Intendant, was created for the collection of minerals; by the end of 1835 it is said to have numbered about 12,000 specimens.

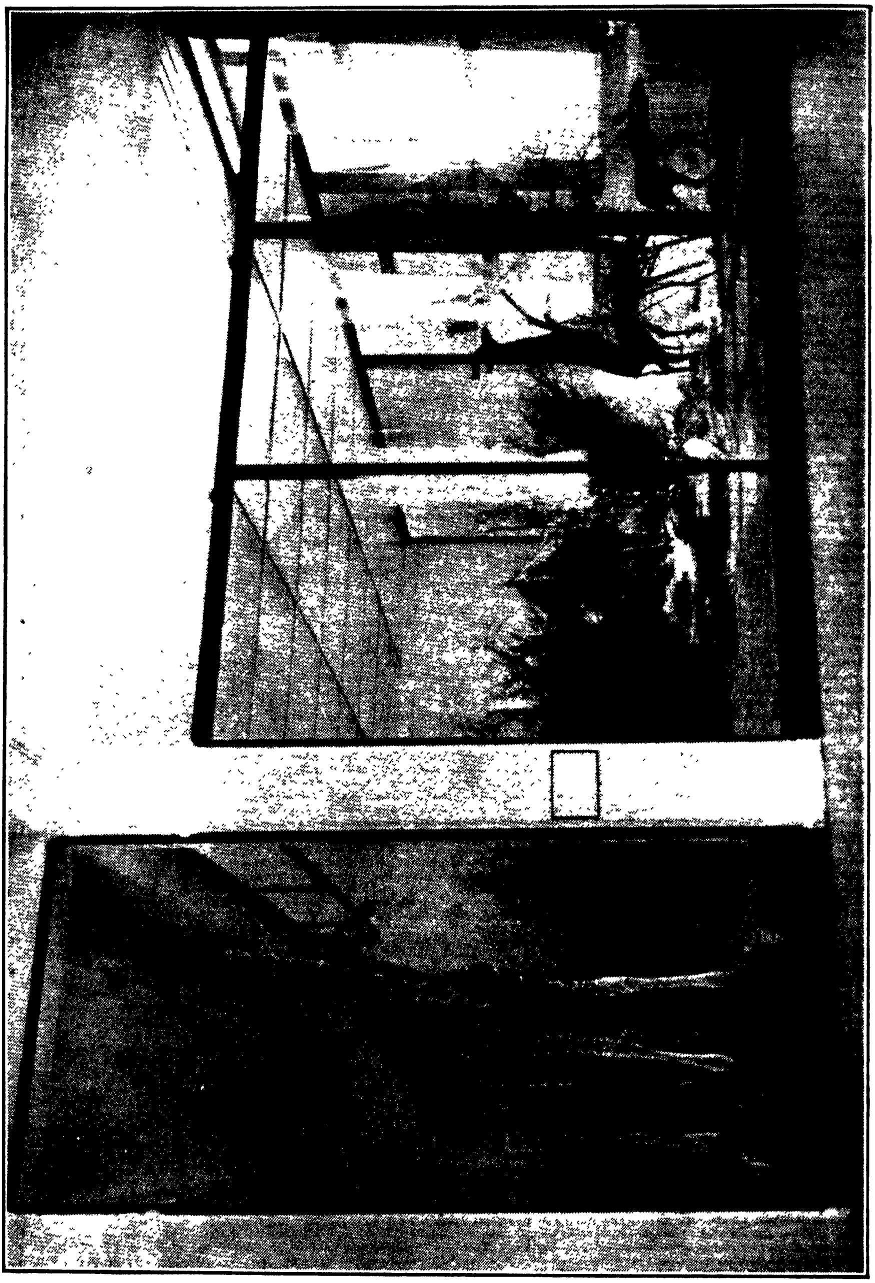
The Zoological Department received an important addition in 1829. A. V. Grill, the owner of a manufacturing estate, and his wife had brought together at their home, Söderfors, quite a museum, containing as it did 80 mammals (among them several rarities, as for example, *Hippotragus leucophaeus*, already then extinct), about 700 birds, some fishes, about 700 shells, and corals, etc. The whole collection was presented to the Riksmuseum by their heirs. Prof. Sven Nilsson, who was for a short time, from November 1828 to March 1831, Intendant of the Zoological Department, was much interested in the Swedish fauna, and decided therefore to form a representative collection in the Riksmuseum. In this project he and his successor, Prof. B. F. Fries, were assisted by many Swedish sportsmen and others interested in it. He extended his operations to the marine fauna of the western coasts, and, in association with Dr. Sven Lovén, the first Intendant of the Invertebrates Department, was the pioneer in the investigation of marine zoology in Sweden. The grants from the State were far from large, and, although the Academy from time to time gave financial assistance, the funds for the acquisition of specimens were inadequate. Prof. Fries therefore endeavoured to add to the collections by enlisting the aid of friends in various parts of Sweden to collect specimens which he was able to exchange for others wanted from abroad. At the same time the Museum received many gifts, including large collections, of which the most important was that made by Dr. Hedenborg during his extensive travels in West Asia and North-east Africa. Unhappily the Museum lost the services of this energetic and enterprising Intendant by death in 1839.

In 1841 the Zoological Department was divided into three: Vertebrates, Insects, and Invertebrates, the respective Intendants being Dr. C. J. Sundevall, who had succeeded Prof. Fries, Prof. C. J. Boheman, and Dr. Sven Lovén.

The Museum benefited by the collections made by J. A. Wahlberg in South Africa in the years 1838 to 1844 and 1854 to 1856, when he was killed by an elephant; and to such an



BIRD ROOM.
The cabinets contain the collection of bird-skins.



East African Scene.

extent that in 1845 it could be said that the Museum contained examples of as many as 530 species of mammals, about one-third of the total known at that time. As, according to the views then held, many of the specimens could be considered as duplicates, Sundevall was able to effect exchanges with other Museums, and in particular to build up a very rich collection of birds, a group in which he was greatly interested. The Museum benefited by the collections made by various expeditions, such as that of H.M. Frigate " Eugenie " round the world from 1851 to 1853, and that of the " Vega " round Asia and Europe.

Specimen of the small Central African Lion (*Felis leo bleyenberghi*).

Prof. A. E. Nordenskiöld, the chief of the " Vega " expedition, was Intendant of the Department of Mineralogy for upwards of forty years, from 1860 to his death in 1901, and thanks to his energy the Department was greatly enriched during his tenure of office; he devoted much attention to meteorites, and at the end of his life the collection contained examples from no fewer than 277 localities. His successor, Prof. Hj. Sjögren, presented the whole of his private collection of minerals, numbering 6852 specimens, and the beautiful cabinets containing it, on condition that it was kept separate for all time. In later years the Department has been enriched by specimens of Swedish minerals, prominent among which are the interesting ones occurring at Långban. Prof. G. Aminoff, the present Intendant has equipped a laboratory with the apparatus required for modern research.

In 1864 a Department of Palaeontology was created, containing both fossil animals and fossil plants, but so rich were the collections of fossil plants brought back by successive Swedish Arctic expeditions, that the Department was divided into two: Palaeozoological and Palaeobotanical. The former is particularly rich in finds from the Silurian deposits of Sweden, and includes the types of the descriptions of Angelin, Lindström, and Holm, the successive Intendants of the Department. During recent years valuable collections of fossil fishes have been acquired, which have been the subject of the well-known researches of the present Intendant, Prof. Stensiö. The first Intendant of the Department of Palaeobotany, Prof. A. G. Nathorst, made important discoveries of sub-fossil plants,

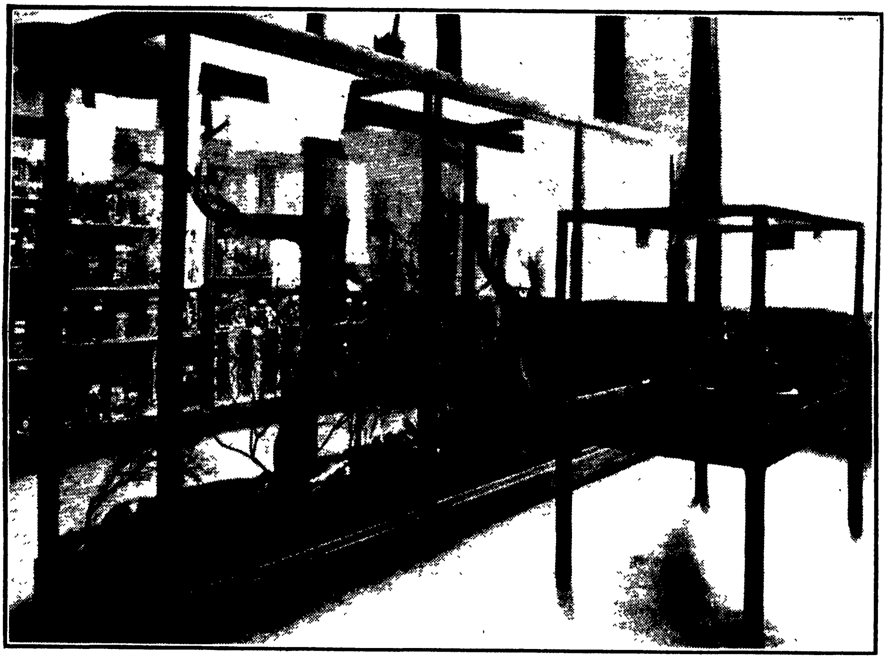
MINERALOGICAL GALLERY.

belonging to Arctic species, which grew in Southern Sweden at the close of the Ice Age. By additions from the Antarctic as well as from Spitsbergen and Greenland, the Museum contains the most important material for the study of the past vegetation of the Polar regions that exists in any museum; it includes the types and other specimens figured by O. Heer and A. G. Nathorst. Of late years the present Intendant, Prof. T. Halle, has paid close attention to the rich, plant-bearing formations of China and has got together the largest and most important mass of material to be found anywhere outside China.

Coral Exhibit.

The Department of Botany contains large collections, not only from Sweden and the Arctic and Antarctic regions explored by Swedish expeditions, but also from many other countries. The Swedish physician, Dr. A. F. Regnell, was a great benefactor. He presented his own herbarium of about 5000 plants, and gave the Academy of Science a sum of money for the preservation and care of Brazilian plants, and in addition a fund for travelling scholarships to enable botanists to visit chiefly Brazil, but other tropical countries in America as well. By this means large collections have been obtained from Brazil and in recent years from Cuba and Hayti; those from the latter islands were got by the late Dr. E. L. Ekman, and are probably the most extensive ever made there.

Dr. Regnell extended his generosity to the Department of Zoology, and gave the Academy of Science sufficient means for the establishment, in 1877, of a permanent marine biological station at Kristineberg, where the early pioneers had been working in the thirties. The co-operation between the station and the Museum has been intimate because the head (Prefect) of the former has always been the Intendant of one of the zoological departments.



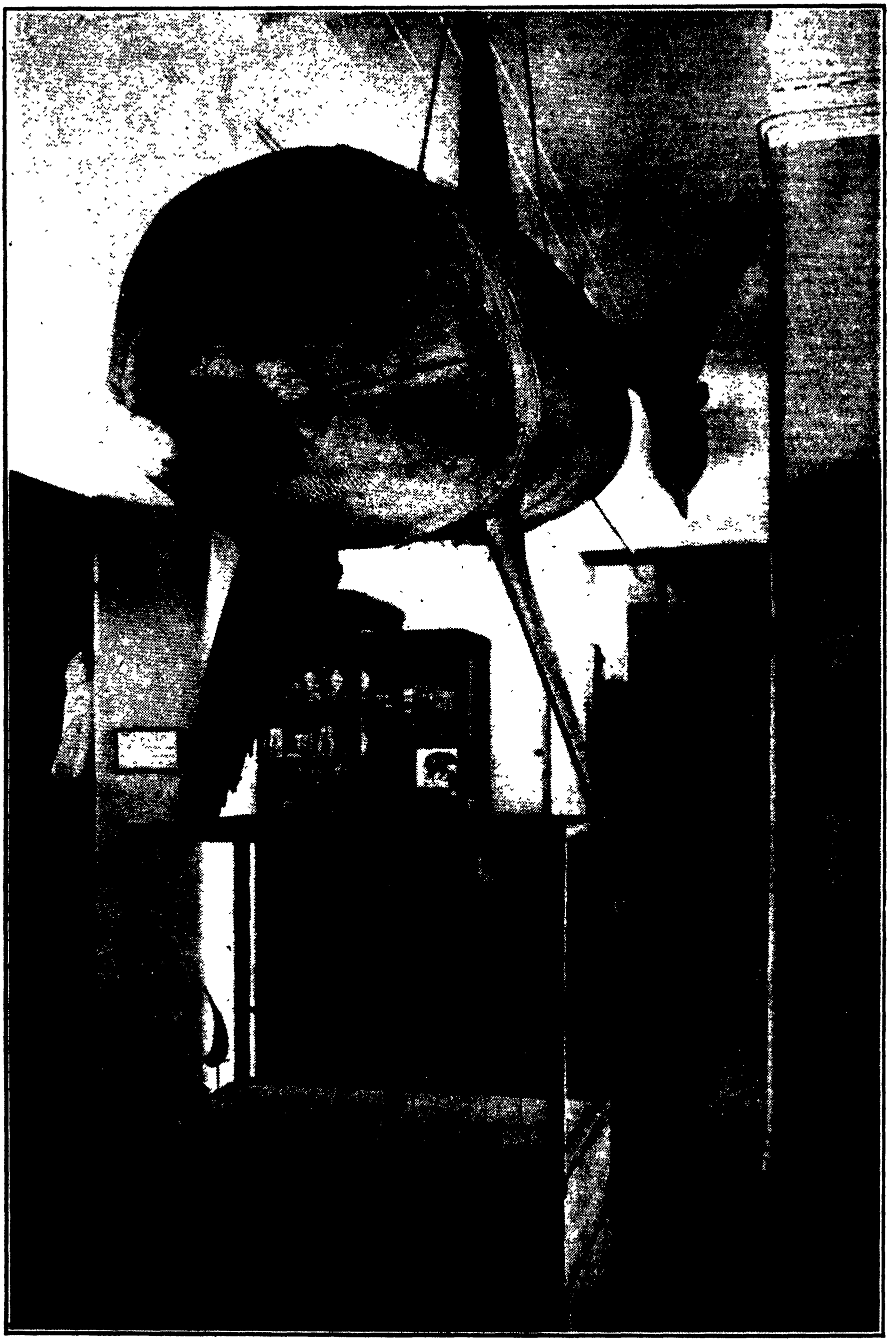
Part of the Reptile Gallery.
On the left, case containing a *Python reticulatus*, from Siam.

During the present century the Vertebrate Department has grown rapidly, collections having come from East Africa, East and South Asia, Australia, South America, Antarctica, etc. The mammals now number nearly 10,000, the birds over 66,000 (excluding skeletons), and the reptiles and batrachians over 10,000; no exact number can be given for the fishes.

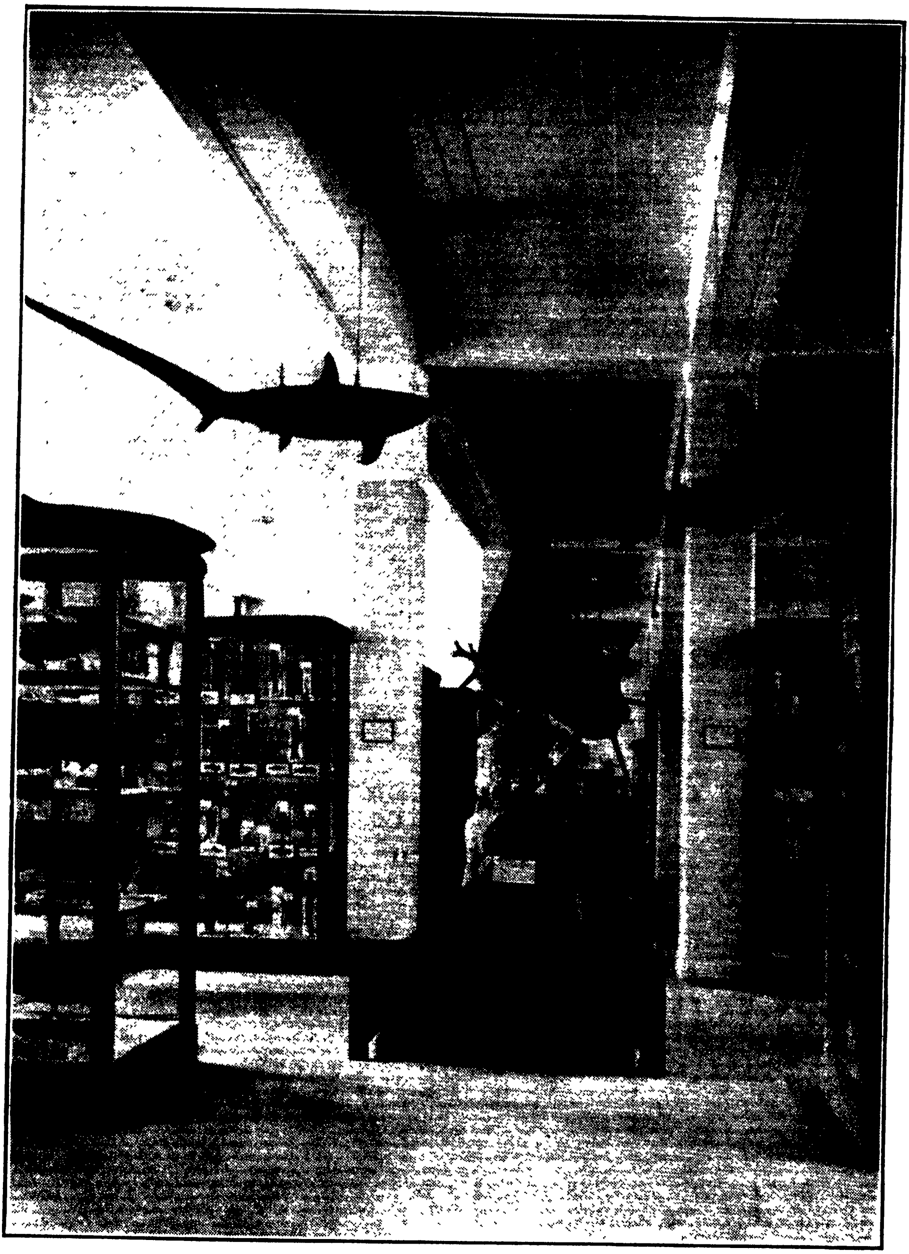
Towards the close of the last century the Riksmuseum began to suffer increasingly from the difficulties of congestion and lack of space which are common to all growing museums. After much discussion the Government finally granted the money for the erection of new buildings on a free site a little outside the city. At the same time, the Academy decided to move its quarters into close proximity, so that its library, so necessary for scientific work in the Museum, was nearly as accessible as before. Further, it was decided that the Geological Survey of Sweden, having many scientific interests in common with the Riksmuseum, should be housed under the same roof. The first to be erected was the new building for Whales, which was completed in 1908. The main building was begun in the spring of 1910; it was opened by the King in 1916, and thereupon was accessible to the public. The area of the exhibition halls, storeroom, and studies for the several Departments is in square metres as follows: Vertebrates 6100; Invertebrates 1620; Entomology 1390; Palaeozoology 1980; Mineralogy 2270; Palaeobotany 1060; Botany 1850; Geological Survey 3720.

WHALE SHARK, *Rhineodon typus*.
Cases of Reptile exhibits at the sides.

The view from the air shows the general lay-out of the Museum. The flat-roofed building on the extreme left contains the collection of Whales. In the adjoining (north) wing and also



Swedish Fish Gallery.
(Above) Basking Shark, *Cetorhinus maximus*; (below) Dog-fish, *Etmopterus spinax*.



Swedish Fish Gallery.

Suspended are three large sharks: (left) Thresher Shark, *Alopias vulpes*; (centre) Greenland Shark, *Somniosus microcephalus*; (right) Porbeagle Shark, *Lamna cornubica*.

in the central section of the main building the ground floor is occupied by the studies and store-rooms, and the first floor by the exhibited series of the Vertebrates Department. On the second floor of the main building the exhibition galleries for the insect and invertebrate collections are on the north side, and those for the palaeozoological collections are on the other side of the central hall. The studies and store-rooms of the Invertebrates Department occupy the upper part of the north wing, and those of the Palaezoological Department such parts of the central section as are not assigned to the Vertebrates Department. The Department of Entomology occupies the highest part of the main building, and the Department of Mineralogy has the front part of the south wing, the exhibition gallery communicating with the Palaeozoological gallery in the main building. The rear half of the south wing belongs to the Geological Survey. The north half of the adjoining building at the back belongs to the Department of Botany, and the south half to the Department of Palaeobotany, the exhibition galleries being on the first floor.

The visitor on entering by the main entrance comes into the Central Hall, in which are the skeletons of two large African elephants and also habitat groups of the fauna of different parts of the world : the Arctic and Antarctic, East Greenland, North America, Western Australia, and East Africa. The Mammal gallery, on the right, contains a large series of specimens interesting to the general public and others important from the scientific aspect. The Bird gallery, on the other side, contains examples of extinct and of rare species, several groups, and an extensive general series. Next to this gallery is a small room containing an historical series of specimens from the old Academy collection and the collections made by Paykull and Grill, all mounted as they originally were and all more than a century old; amongst these old things are some of great scientific value.

From this room the visitor passes into one with a complete collection of Swedish vertebrates, including a number of habitat groups. Next are the exhibits of reptiles and batrachians, with two habitat groups. The next section contains the exhibition of fishes, mostly in alcohol. In the same hall are cases containing Swedish domestic animals and an exhibition of skins used for fur. The last hall is filled with a collection of skeletons of different classes of vertebrates, ranging up to man.

On the second floor to the left is first the exhibition of various series of insects: giant, useful, or noxious insects, beautiful butterflies, and also some groups illustrating the

WHIPSNADE ZOO: DUKE'S AVENUE.

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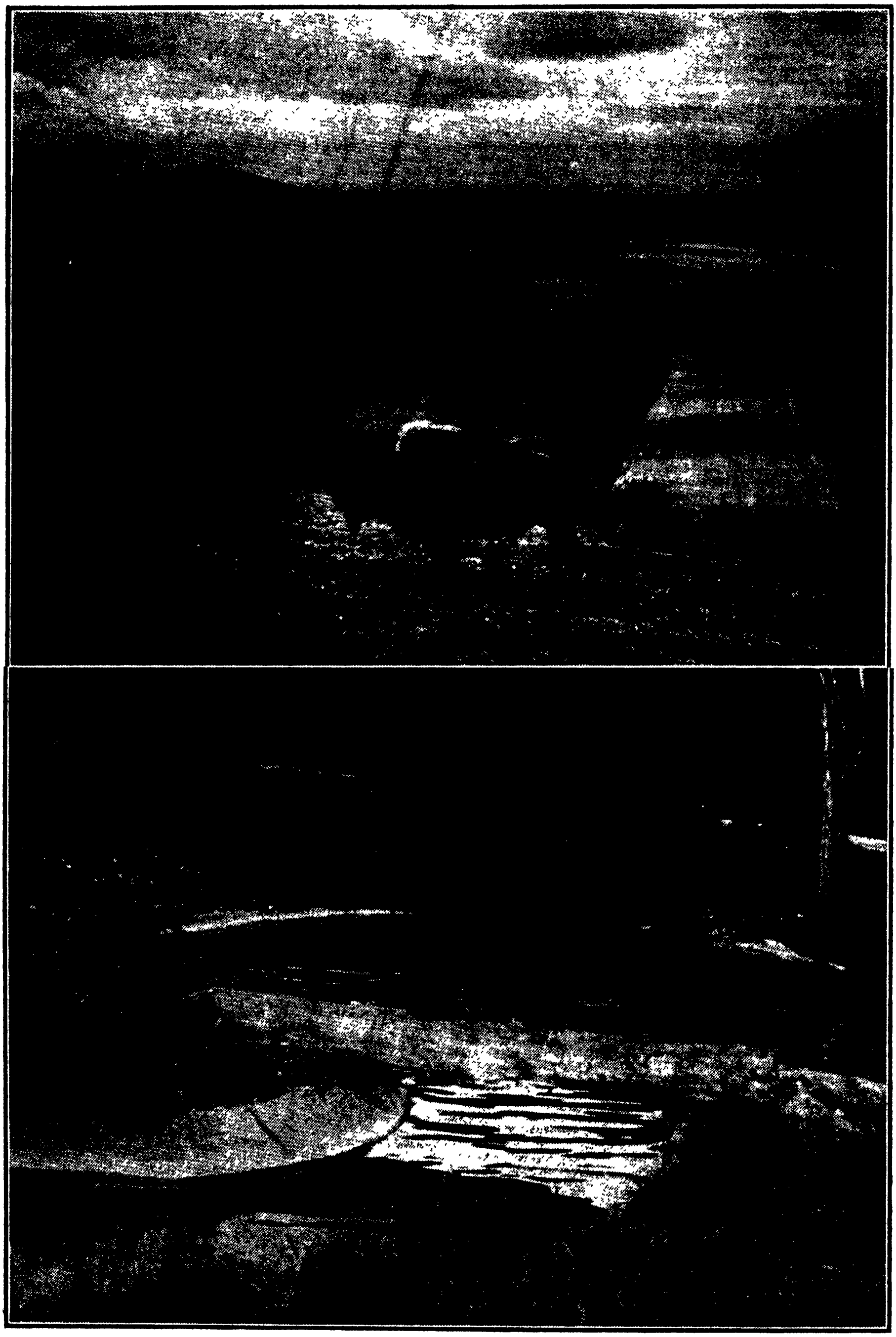

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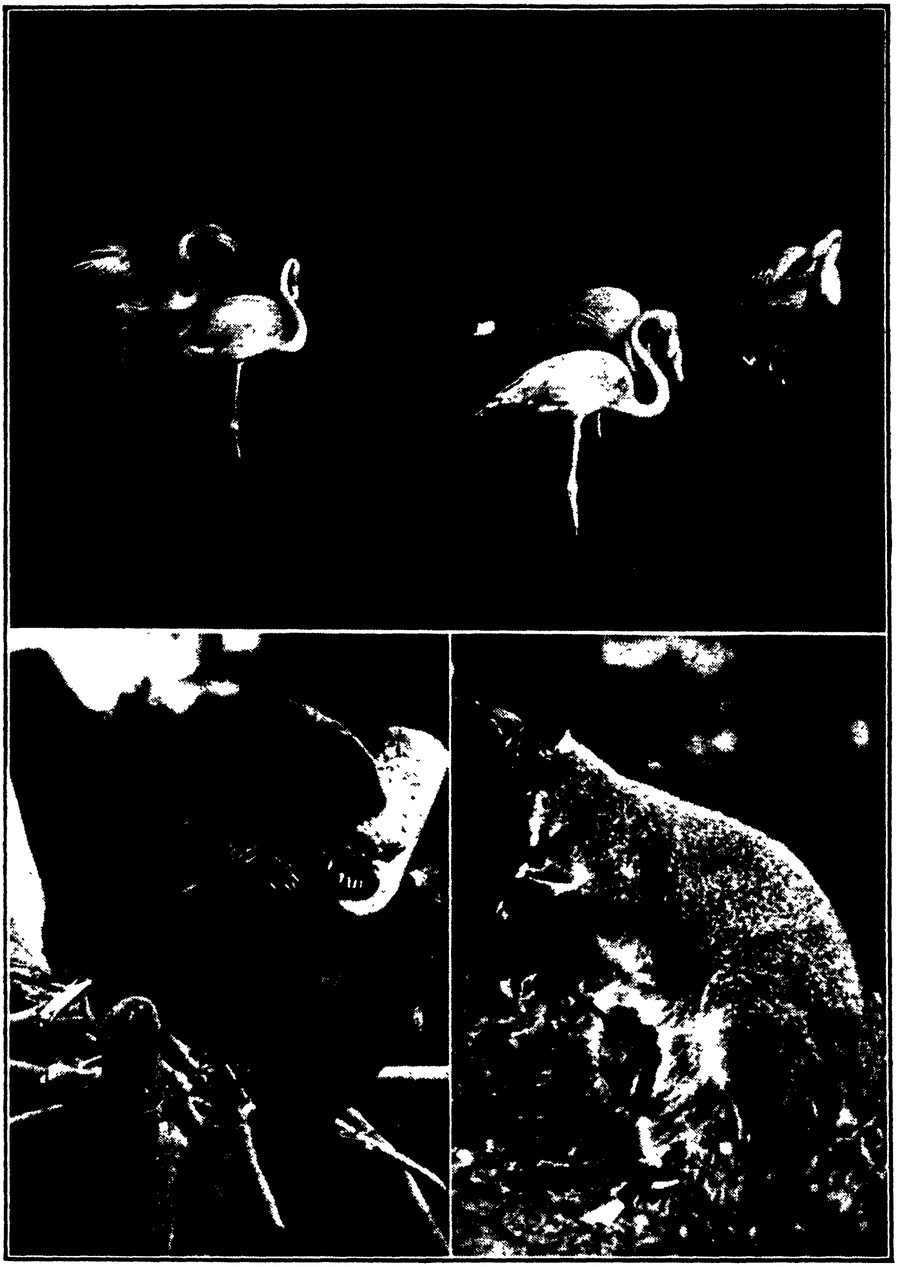
WHIPSNADE ZOO: (Upper) AMERICAN BISON; (Lower) BROWN BEAR.



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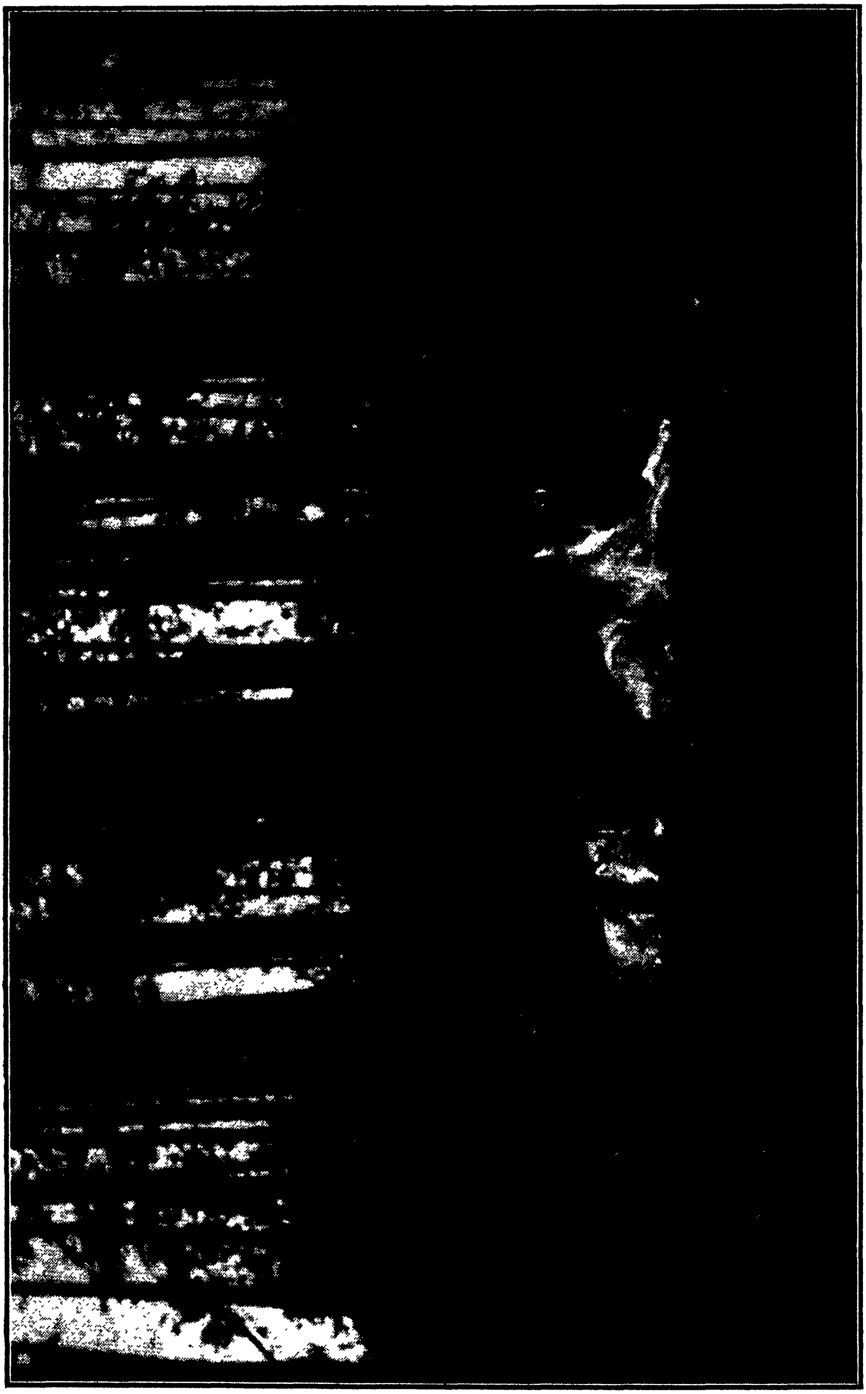
Whipsnade Zoo: (Upper) Flamingoes; (Lower) Himalayan Bear, Wallaby and Young.



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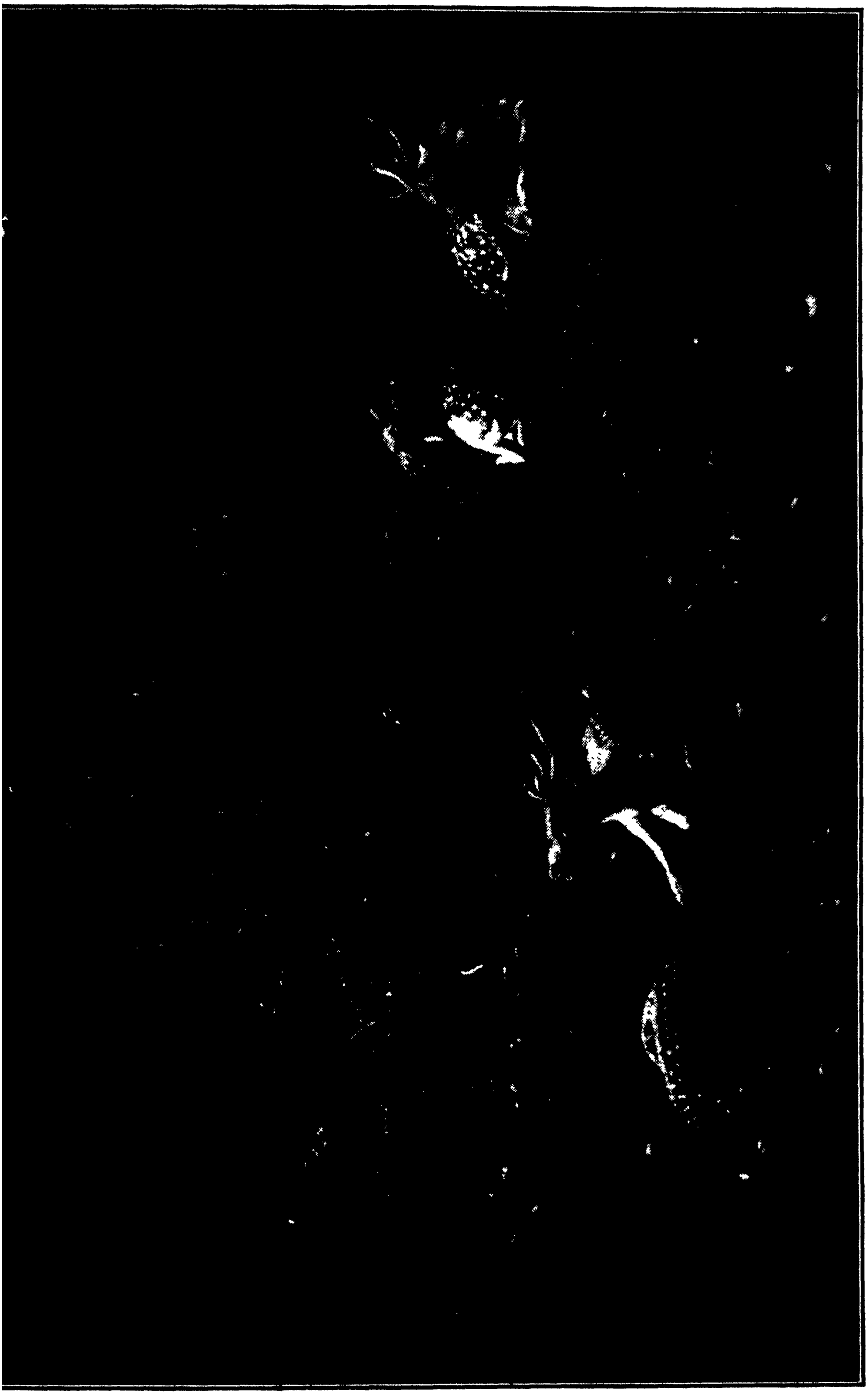
WHIPSNADE ZOO: WOLVES.



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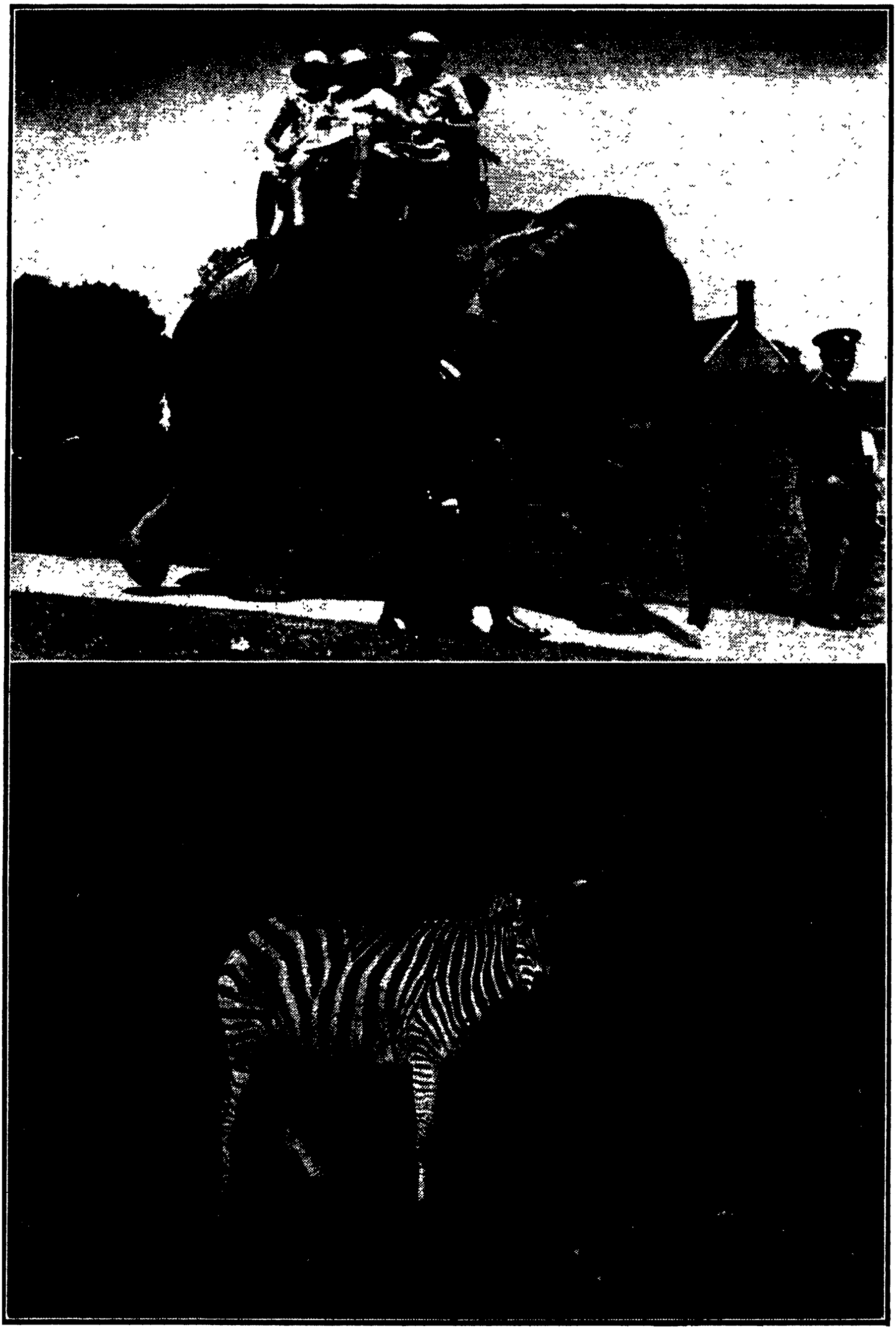
WHIPSNADE ZOO: AXIS DEER.



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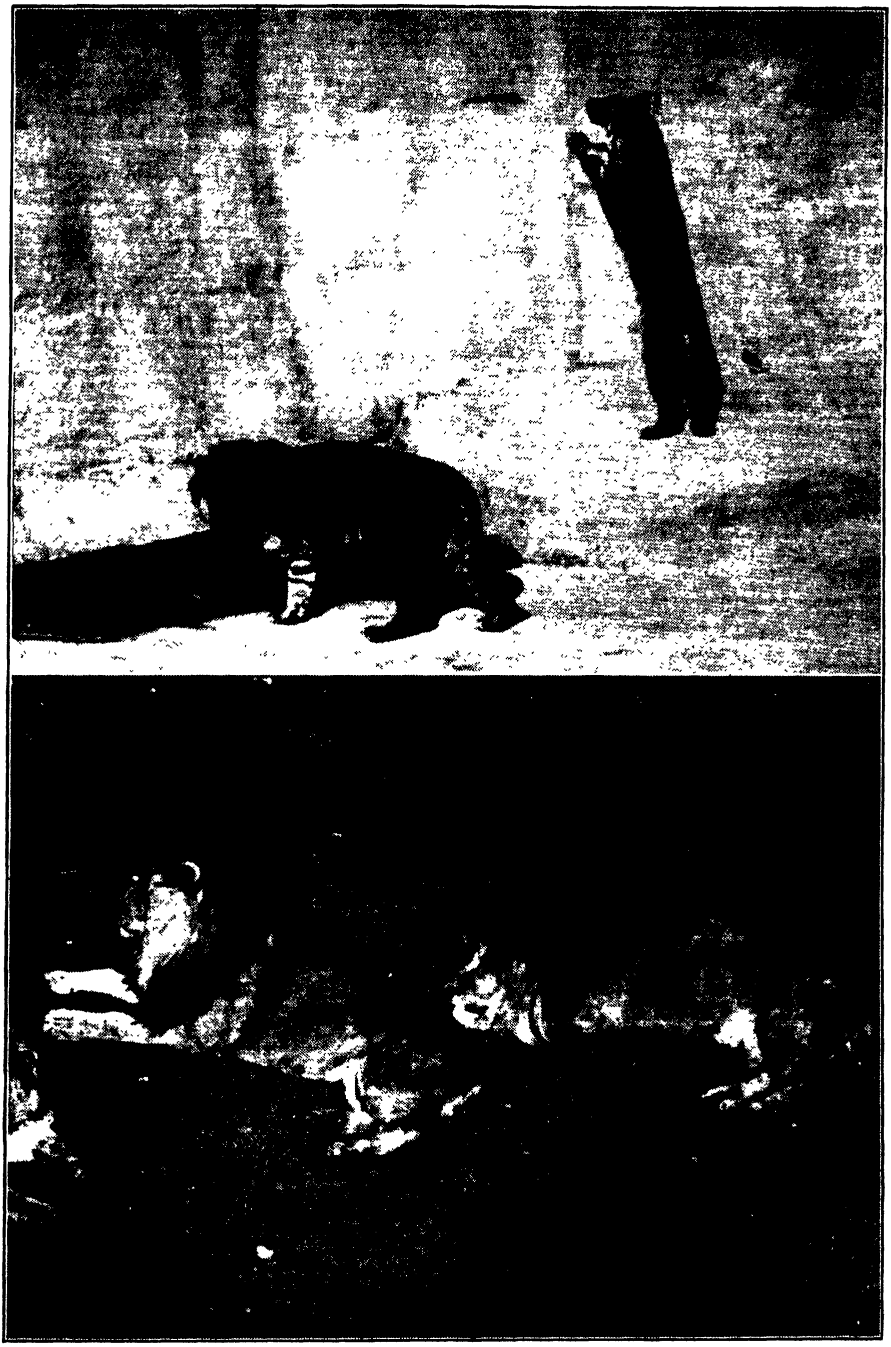
WHIPSNADE ZOO: (Upper) BURMESE ELEPHANT; (Lower) CHAPMAN'S ZEBRA.



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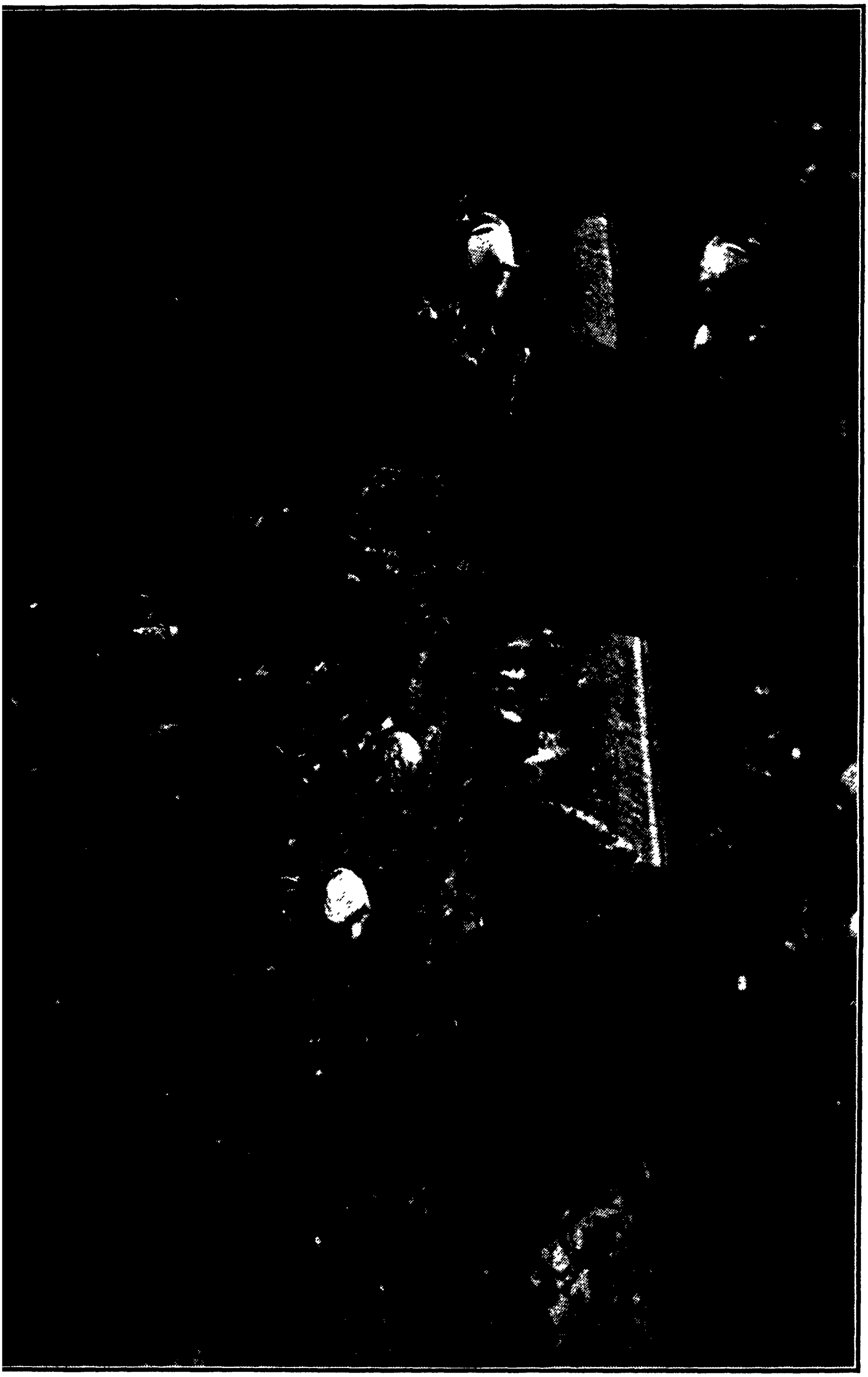
WHIPSNADE ZOO: (Upper) TIGERS; (Lower) LIONS.



WHIPSNADE ZOO: MANDARIN DUCKS.

Copyright Photograph by F. W. Bond.

remarkable termite communities. Next come the invertebrates, with a systematic collection of marine animals. On the opposite side of the central hall are the large fossil reptiles as well as the original material from the Swedish deposits of Silurian age. Passing through this gallery, the visitor comes to the minerals, including ores, and meteorites.

The Whale hall contains an unusually large series of the large whales. There are the skeletons of all the Northern Whales, including a splendid Greenland Whale with a complete set of baleen, and also several Antarctic whales. The Grey Whale (*Rhachianectes*), probably now extinct, is represented by a complete skeleton, and the skeleton of *Balaenoptera brydei* may be unique. Also there are skeletons of Cachalot and Bottlenose Whales from both the north and the south, a number of small Odontoceti, and a skeleton of the extinct *Rhytina stelleri.*

The Riksmuseum is open on Monday, Tuesday, Thursday, and Friday from 11 a.m. to 3 p.m., on Wednesday and Saturday from 12 to 3 p.m., and on Sunday from 1 to 3 p.m.

BEHIND THE SCENES IN THE MUSEUM. III.

By W. E. SWINTON, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

IN the second article of this series the work of the Office and several of the sections under its control was briefly described. The largest, and the most important, section directly in the charge of the Office is that of the Works Staff, which includes the Maintenance Staff, and is composed of those persons who are concerned with the artisan side of the Museum's work, with the reception and dispatch of stores and specimens, and with the upkeep of the cabinets and their fittings; a separate staff under the control of His Majesty's Office of Works is responsible for the structure of the building. Essentially these are people who are normally confined to their workshops and who are only occasionally, if ever, under the eye of the visitor. Their comings and goings, like those of the specimens, are by the back-door. This distinction does not demarcate them in any very profound sense from the users of the public entrance, but it does divide the Museum very definitely into two main parts: the one that is connected with the actual public exhibition galleries, and the other that forms a little factory whose workers but seldom penetrate into those places to which the public have access. It is perhaps worth stressing this point; for members of the public on being conducted to the study of one of the Scientific Staff, and having occasion to pass through the workshop area, are almost invariably surprised to see the number and variety of the trades that have to be included in the Museum's precincts.

The subject may be conveniently treated under three headings: the buildings, the specimens, and the personnel.

The workshops of the Maintenance Staff are concentrated along the back of the main Museum building and there also are the tradesman's entrances and the through passage-ways for vehicles arriving with specimens or materials. The front of the Museum may be claimed to form one of the familiar London landmarks; but few people are acquainted with the northern or back aspect (Fig. 1). Bounded on the west by the New Spirit Building, which houses parts of the Entomological and Zoological Departments, and on the east by the newly built Museum of Practical Geology, in which at the moment the Economic Conference meets, the back of the Museum is not visible from either Exhibition Road or Queen's Gate, on to both of which its carriage-ways enter. During the war the ground in this area was used by various military organizations and the huts that served their purposes long remained as an eyesore. Fortunately the construction of the New Whale Gallery and the Museum of Practical Geology gave the Office of Works an opportunity of improving the Museum's grounds, and the present lay-out combines a spaciousness and dignity in striking contrast to the conditions of a few years ago. Some further improvement and buildings await the coming of more prosperous times, but the present condition is well shown in figure 2.

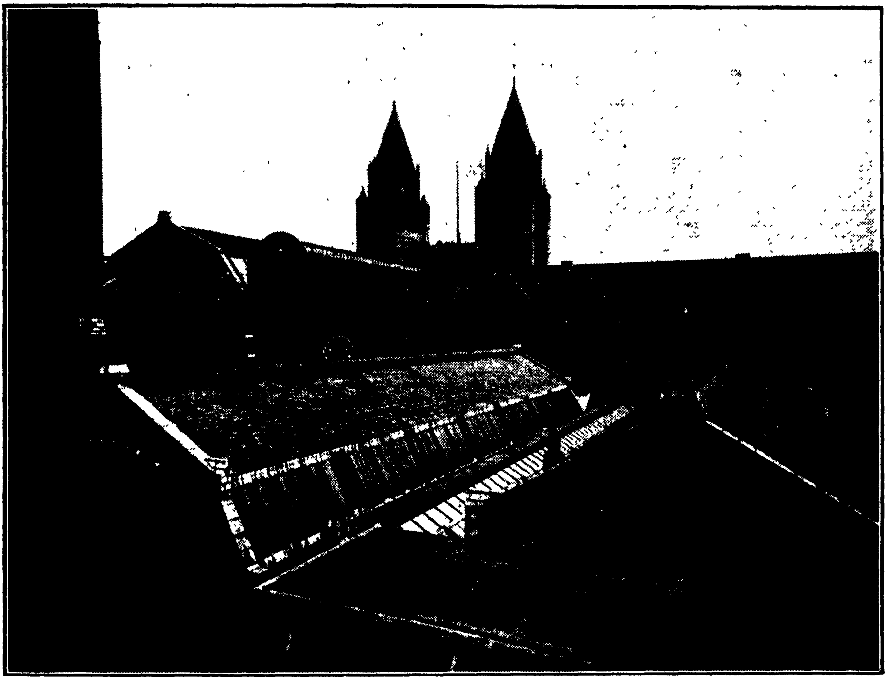


FIG. 1.—MUSEUM MAIN BUILDING FROM THE BACK.

The back of the main part of the Museum building is composed of a colonnade into which the majority of the workshops open. There are several other laboratories and workshops in other parts of the building, but these will be dealt with later under the various Departments.

It has been said that the back entrances open on to Exhibition Road and Queen's Gate, but it is by the former that the main part of the collections and stores arrive. All specimens too large to be sent by post or to be conveyed by hand come by this back-door route, and the specimen may vary from a small stuffed animal to a whale, or to a great prehistoric reptile, whose bones have to be conveyed on a steam wagon, and the collection from one small box to hundreds of heavy packing-cases. Naturally, every specimen and every box, heavy or light, has to be handled with the greatest caution, so that one of the first needs is for a staff trained to handle boxes with care, and actually to understand the meaning of those admonitory labels which so often prove futile. Enthusiasm and energy are qualities seldom to be discouraged, but their display when unpacking or handling a valuable collection should be modified. In this connexion it may be mentioned that the Customs authorities have much to answer museums for, and that Customs examination has on occasion done more harm to a collection than a long voyage and the rigours of expeditionary travel. The Museum is fortunate in this respect, for all material is permitted to enter it under seal and to have the examination conducted on the premises under conditions that ensure due appreciation of the contents. As

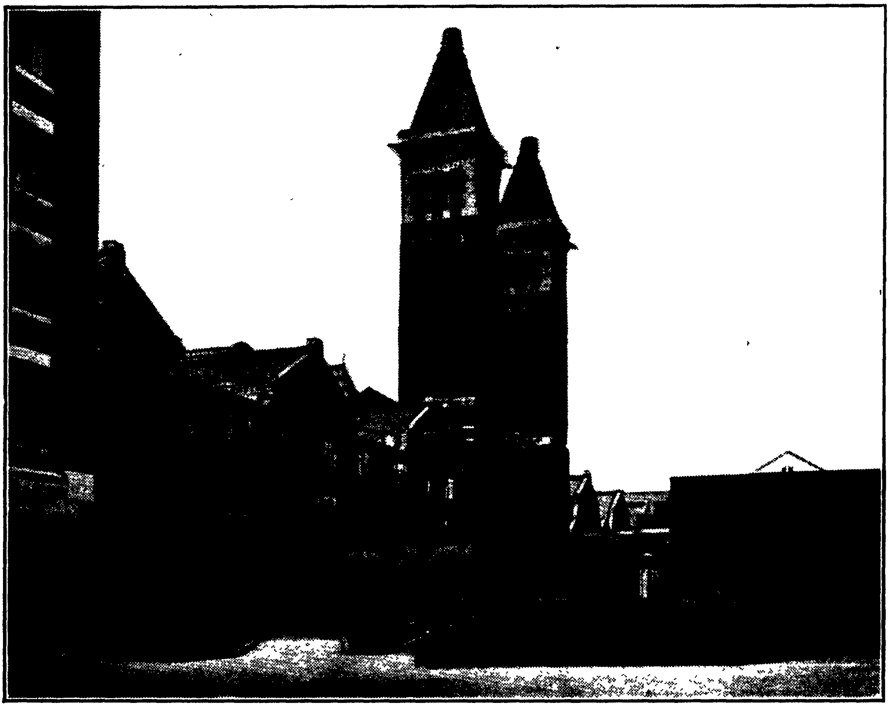


FIG. 2.—MUSEUM BUILDINGS, NORTH-EAST CORNER.

Old Spirit Building on right, roof of new Whale building beyond. Fan-chamber in centre. Studies of Department of Geology, in two storeys, above colonnade. Corner of new Museum of Practical Geology on left.

many of these specimens are priceless in that they are irreplaceable, it will be realized that the stress laid on the most careful handling is not unnecessary.

All boxes arriving at the Museum are carefully examined, checked, and, as soon as possible, transferred to the appropriate scientific Department for treatment. As specimens which are packed for travelling are not necessarily in a condition for continued storage, immediate unpacking and some form of treatment before use or storage is essential, so that these duties engage the constant attention of a number of men. The amount of material constantly arriving from, or leaving the Museum for, all parts of the world is considerable, so that quite a busy clearing house is maintained. The approaches to the Museum are suitable for every type of road vehicle and the mechanical methods for dealing with heavy boxes are adequate. An ordinary hand-crane (Fig. 3) and a gantry crane meet most requirements. For the transfer of heavy specimens from the ground to higher levels there is a hydraulic hoist in the Geological Department, while it may interest visitors to know that there is a crane in the Central Hall which raises specimens to any floor required through an opening in the floor just at the Bookstall (Fig. 4). This latter process is always accomplished between 7 a.m., when the workshops open, and 10 a.m., when the Museum is open to the public. Of course, moving specimens by cranes is an ordinary procedure by very ordinary means, but the handling of stuffed elephants, dinosaur skeletons, or meteorites is not, or at least it should not be, quite so simple or carefree an operation as the handling of sacks of potatoes or bags of coal. How many visitors to museums, who think that things move slowly in the exhibition galleries, pause to consider the processes involved; of the long, careful, and skilled work necessary to prepare and mount, for example, a stuffed giraffe and, though it is the least part of the work, of the difficulty of moving the specimen; for animals like giraffes are not usually stuffed and prepared in the middle of public galleries? At any rate a little reflexion will show that there is no stage in museum work where carelessness is safe and that in most cases the apparently ordinary processes are full of danger if the staff be not trained and appreciative of the things that they handle.

The number of the Works Staff normally employed about the Museum is nearly one hundred, and of these eighty or so are on the Museum staff; the remainder are employees of the Office of Works. The Museum Works Staff is directly under the control of the Director's Office, but is itself supervised by the General Foreman. There is also an Assistant Foreman and Storekeeper

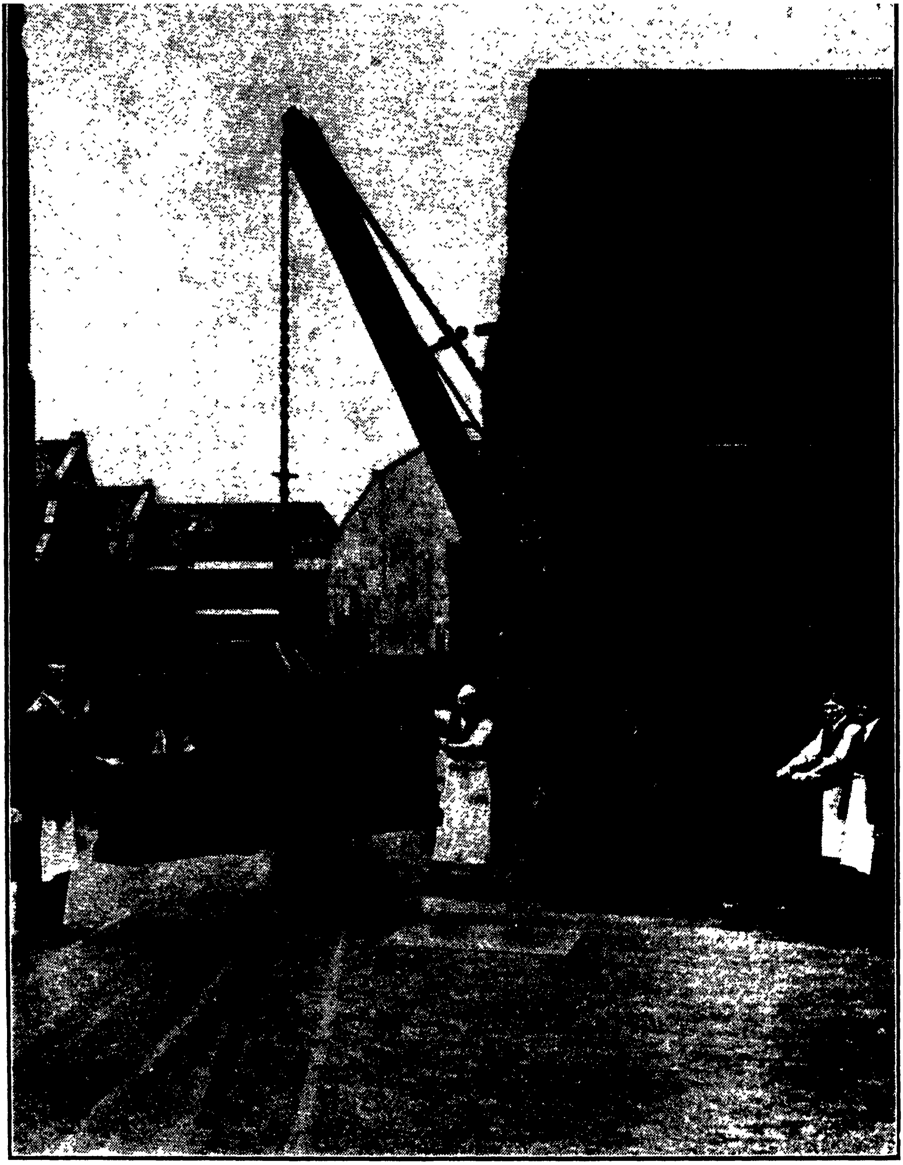


FIG. 3.—HAND-CRANE FOR HEAVY CASES.

Adjoining it is the old Spirit Building.

and a Timekeeper, whose duties are sufficiently obvious from their titles. The engineering side is under the care of the Office of Works. Of the Museum Works Staff a number have already

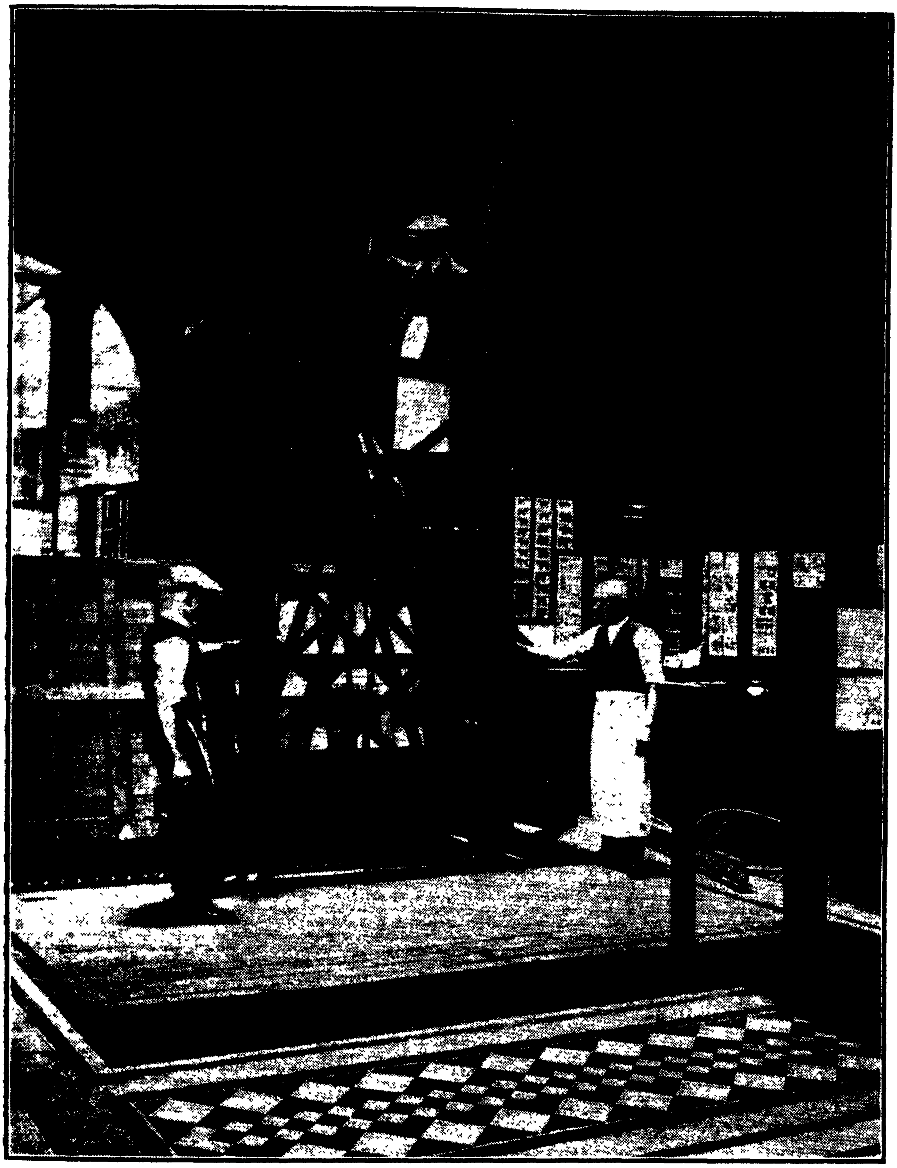


Fig. 4.—Trap and Hoist in Central Hall.

been mentioned in the first of these articles, namely, the Firemen, Gate Attendants, and Housemen, whose duties are concerned with maintaining the safety and cleanliness of the Museum.

Every visitor will have noticed that the specimens are all specially mounted in one way or another. Some are on mahogany bases, others on specially fitting stands literally made to measure, many on tablets, and most of them in well-finished wall- or table-cases. All these methods of mounting must be efficient, that is, they must suit the individual needs of the specimen in fit and in strength without being so obtrusive as to detract from its exhibition value. In addition, the cases have to be dust-proof and air-tight. The amount of time and work that must go to the complete preparation of a specimen is seldom realized, but a case or a mounted skeleton may well take months to prepare. New exhibits are constantly being set up, temporary exhibitions have to be arranged, stereoramas and dioramas are under construction, and the older cases and the general run of exhibition galleries have to be constantly surveyed and renovated. In addition, there are the hundred and one pieces of work required in making crates and packing cases, and all sort of minor fittings for exhibits and articles for studies, workshops, and store-rooms. The quality of most of this work is in keeping with the value of the specimens, and may readily be appreciated by even an untutored eye in the Museum galleries. For all these undertakings the Museum worker is dependent upon the joiners, and the Museum is fortunate in the men employed in this capacity. Their skill saves the Museum—and, incidentally, the tax-payer—hundreds of pounds every year; for the cost of most of the articles that they manufacture, when done by outside contractors, would be considerably higher than is now the case.

There are two well-equipped joiners' shops, one in the eastern and one in the western part of the main building, and there are ten men in constant employment. A few years ago the Maintenance Staff was employed through contractors, but now it is directly employed. The amount of power-driven machinery has been considerably increased of late years. It is all concentrated into the machine-shop, which is a spacious and well-fitted workroom very suitable for the class of work which must be obtained from it. The wood-working machinery in use consists of circular saw, planer, planer and thicknesser, French spindle, and grinder, all of them operated by electricity. Figure 5 gives a view of the machine shop. All the classes of work wanted by the Museum can be supplied by such a shop and many beautifully turned mahogany stands, frames, bases, and pedestals are produced. The eastern shop is occupied by three joiners who work principally for the Geological and Mineral Departments, and who produce most of the carefully finished and well-fitting wooden mounts required for the display of such varied objects as precious stones and giant prehistoric skeletons. It is unfortunate that the careful and highly skilled work done by these men is so little realized and that so often they are referred to as carpenters.

But mounts and cases are not made by joiners alone, and the smiths, the painter, and the polisher have all their parts to play. The Museum maintains a small, but well-furnished smith's shop, where a smith and his assistant preside over lathe and forge, so that the traditional music of the country smithy can occasionally be heard to echo in the museum. There is plenty of business too even if there is never a horse to be shod, or an iron tyre to be shrunk on to a felloe. There are locks and keys in plenty to be mended, scores of iron fittings to be repaired or moulded, and, if one looks at one of the mounted skeletons of fossil mammals or reptiles and sees the wrought iron support that bends and twists to conform to every feature of the back bone and limbs it bears, one can realize some of the tasks that keep the forge-fire cheery and the sparks flying.

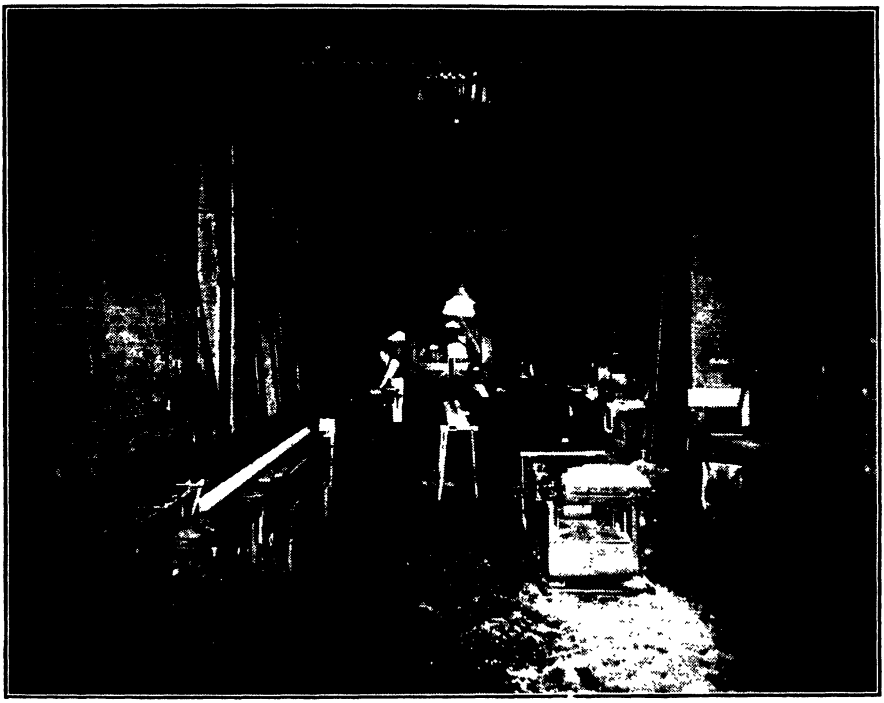


Fig. 5.—Wood-working Machine Shop.

When the joiner and smith have done their turn the painter and polisher have to step in, and for both again there is always plenty to do. Each has a spacious and fully equipped shop, where the fine end to a good job can conveniently be applied. In many ways the painter's and the polisher's work in the Museum is like that of their confrères of the Forth Bridge. It is never done; for when one end is finished they have to begin all over again at the other. Constant renewals, and refreshing old cases, fill in all available gaps between new jobs.

In addition there is the glazier and plumber who also has his shop and his steady trade, for there is no unemployment here. The area of glass in the Museum galleries alone, and the amount used in shelving, for exhibits, special cases, dioramas, etc., makes any elaboration of the need for this member of the staff unnecessary. It should be remembered, however, that what has been said of all these craftsmen is concerned with the actual Museum work for the public only and does not include the great amount of maintenance work constantly necessary in any large building for whatever purpose, though this work on the general fabric is mostly done by the Office of Works.

It is impossible to close this account without reference to the electricians of the Office of Works, who, though they are mainly concerned with the general aspect of the Museum, are responsible for much of great exhibition value, and are a constant assistance to the scientific workers in the study or in the preparators' shops. The Museum possesses so much varied electrical apparatus that a good staff in constant attendance is necessary. There are hundreds of electric lights and points for various purposes, electric heating, and refrigerating plants, electrically controlled thermostats, an X-ray outfit of high voltage, electrically operated pneumatic drills and hammers, passenger lifts, to say nothing of the many ' gadgets ' used for exhibition purposes, as, for example, the ultra-violet lamp on the first floor and the Elephant Scene in the Central Hall. Many laboratory processes and study methods employ electrical devices on both alternating and direct currents, and the mere fact that all these requirements are readily and unostentatiously met is a testimony to the electricians that needs no elaboration.

Add to all these workers those that are necessary for sending off parcels and publications, for ensuring the safety and comfort of the visitors, and the safety of the collections, and it will be seen that quite a company of men is steadily, quietly, and efficiently engaged on behalf of the visitor, and the result is really a fine piece of team work.

There are, alas, many who think that exhibition galleries are easily arranged and that to stick an object in a glass case is to make an exhibit. Working on these lines museum technique would be simple and, with such a staff as this Museum has and with so many acquisitions, the arrangement of exhibits should be quick and plentiful and the galleries should have kaleidoscopic change. Exhibition should dawn in fresh exhibition as night into morning, and if, like the passing of the night in the Elephant Scene in the Central Hall, this can be done by pressing a button the greater will be the sensation. But good museum technique is not accomplished in that way. The simplest exhibit may take a long time to prepare, just as a simple discovery may be of the greatest importance. Quick changes, even if sensational, are not necessarily of museum advantage. Quick returns are so often associated with small profits. Though to press a button and achieve an effect is attractive, especially to children, it may lead to knowledge only of how to press a button. More or less permanent exhibits should not be decried because they are so fixed, for most of the greatest truths are those that remain fixed through all the changes of philosophy and outlook.

But to return to the Works Staff, visitors who wish to see the results of their activity or efficiency do not need to see them at their work. “The proof of the pudding is in the eating”—not in seeing it made. If the exhibits are carefully examined, especially the later ones, and attention is paid to the carefully cut glass, the polished stands, the finely carved mahogany bases, the carefully worked iron supporting skeleton, shell or stone, even the untechnical can appreciate that these things are not the work of careless or uninterested men, but that the craftsman together with the preparator and the scientist produces a harmony the ultimate result of which is the Museum.

THE PIGMY ANTEATER.

By Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

Pigmy Anteater.

The Pigmy, or Two-toed Anteater, is a member of the family Myrmecophagidae of the order Edentata. The Myrmecophagidae, or Anteaters, are a group of Edentates in which no teeth are developed, the body is clothed with hair, the mouth tubular and the tongue long, viscid and extensile. These animals feed exclusively upon animal diet, their chief food being ants and other insects. Three genera may be distinguished: (*a*) *Myrmecophaga,* including only the Great Anteater (*Myrmecophaga jubata*), a terrestrial animal; (*b*) *Tamandua,* the Tamandua Anteaters, of which a number of forms may be distinguished, all of which are arboreal, medium-sized animals with prehensile tails; and (*c*) *Cyclopes* (formerly known as *Cycloturus*), which contains the Pigmy, or Two-toed Anteaters. The latter agree with the Tamandua Anteaters in possessing a prehensile tail, but the skull is much shorter and is arched in a longitudinal direction. The specific name is "*didactylus,*" and has reference to the two-toed appearance of the fore-feet, the third and second digits alone bearing claws, the third digit being much larger than the second. The fourth digit is represented only by the metacarpal and one nailless phalanx, and the first and fifth digits are represented only by very small metacarpals, the whole limb forming an ideal climbing organ. The hind-feet are also specially modified in the same manner, the great toe being quite small and concealed beneath the skin and the other four toes armed with long, curved claws. The tail, which is bare on the undersurface near the tip, is long and very prehensile, resembling the tail of the Tamandua Anteaters, except that the upper surface of the terminal portion is covered with hair.

At first glance these little anteaters would appear to bear little or no resemblance to their large terrestrial cousin, the

Great Anteater, but cranial characters show that they are undoubtedly members of the same family. Like the Tamandua Anteaters, they have developed special adaptations for their completely arboreal existence. It is difficult to understand how an animal modified in this fashion would fare if forced to leave the trees in which it makes its home, as the limbs are quite unsuitable for terrestrial progression, and a Cyclopes on the ground would probably be as badly handicapped as a Sloth.

In general dimensions these little anteaters are about the size of a rat and are clothed in very soft and silky coats; the latter are very beautiful in colour, being a kind of silvery-gold washed on the back with brownish-buff. The young pelage is more woolly and not so silky as in the adult. The range of distribution is confined to the forests of Central and South America.

The two specimens here illustrated are an adult and young individual, and were mounted in the Rowland Ward Studios. They are now on exhibition in the Lower Mammal Gallery, and are the gift of the Rowland Ward Trustees.

A "ROMAN" SNAIL IN THE MUSEUM GARDEN.

By G. C. Robson, M.A., Deputy Keeper, Department of Zoology.

In October 1931 one of the gardeners working in the Museum grounds discovered a living specimen of the "Roman" Snail, *Helix* (*Helicogena*) *pomatia*, meandering across a flower-bed near the railings on the north side of the West garden (adjoining Queen's Gate). It was a typically coloured adult apparently in the enjoyment of excellent health. The occurrence of this snail in a London garden is of some interest and calls for discussion.

The so-called Roman Snail is found sporadically over a considerable part of south-east England. Its metropolis seems, however, to be Surrey, and in particular the North Downs in the region of Box Hill, Epsom, and Dorking. The nearest place to London at which it occurs seems to be the Croydon–Sutton area, and it has never been recorded from London itself, unless we reckon some "introduced" specimens released at Wandsworth and Balham. Whether the North Downs are a focus of distribution from which it has been carried by man to the more outlying parts of its distributional area, or whether the sporadic colonies found over a wider area are the relics of a denser and more continuous population is uncertain. As it seems to prefer limy soils, it is not likely to have had a wide extension off the chalk massif of south and east England. For our present purpose it is important to notice that there are plenty of records of its having been transplanted from place to place with the object of getting it to colonize new areas (*cf.* Taylor, "Monograph of the Land and Freshwater Mollusca of the British Isles," vol. 2, p. 230); and the question naturally arises: how did the specimen discussed in this article reach the Museum garden?

The specimen was a large one, measuring over 40 mm. in length and weighing 19 grams, and it is very improbable that it was accidentally transported by a bird, although fairly large snails (e.g. *Helix aspersa*) have been seen carried about in this way. The other possibilities are as follows:—

(*a*) It might have been accidentally introduced in packing material and found its way to the garden, *e.g.* from outside the taxidermists' buildings. Mr. J. R. le B. Tomlin informs me that he once found two specimens of the North African Desert Snail (*Eremina desertorum*) on some packing material that had fallen from a case that was being unloaded in the back premises.

(*b*) It is just conceivable that our *H. pomatia* might have been carried from Surrey or elsewhere on part of a vehicle which was "parked" either in the front or the back of the Museum. A smaller snail, *Cochlicella acuta*, was found by Mr. G. Rice on the mudguard of a car (*Journal of Conchology*, 1930, p. 26), at some distance from its distributional area. Neither of these suggestions (*a* and *b*) is very plausible, as they involve the escape of the snail from the back premises or the front "parking space" into the garden.

(*c*) The snail may have been brought directly into the garden with soil, turf, or plants.

(*d*) It might have been brought to the Museum for determination by a visitor who, disappointed at the commonness of his or her prize, crept away to the garden and deposited the now-despised object under the nearest bush.

(*e*) In the past there seems to have been a "craze" for experimenting in the transplantation of this species; it is possible that this has not entirely spent itself and that our *H. pomatia* may have been privileged to serve as the material for such an experiment. It is perhaps relevant to this suggestion to mention that *H. pomatia* is one of the "domestic animals" of the zoological laboratory.

On the whole I am inclined to believe that it was intentionally introduced (either (*d*) or (*e*) above) or that it was accidentally imported in garden-material. I am indebted to T. Hay, Esq., Superintendent of Hyde Park, for the following information:— "The Snail may have been brought in with the manure during the Autumn period 1930–31. This farmyard manure is got from somewhere out Norwood way . . . or it may have gone down in the soil in which the plants are grown. This is also brought by us and is from some old Surrey pasture."

It may interest the reader to know that the name "Roman Snail" was based on a belief that *H. pomatia* was introduced into England from the Continent by the Romans. This belief was due to the frequent occurrence of the shell in Roman sites and occurrences of the living animal near the latter. It is quite clear, however, that it has been found in pre-Roman deposits.

A RARE DEEP-SEA ALCYONARIAN POLYP.

By A. K. TOTTON, Assistant Keeper, Department of Zoology.

THE size of an animal is for many people the common measure of its interest; and it is easy to understand how this feeling of awed interest must have been evoked in the heart of primitive man by the sight of large and savage animals. To-day we are no less interested in small and even passive creatures like the corals, anemones, and polyps, which latter include the subjects of this article.

We are indebted to the Eastern and Associated Telegraph Company for collecting these remarkable polyps off the cables. This cable company has already presented to the Museum much valuable material removed by their officers from cables under repair from time to time. Only once before has a specimen of *Bathyalcyon* been seen, and that was fished up by the famous Dutch "Siboga" expedition in 1899 from a depth of 924 metres (500 fathoms) in the Malay Archipelago, east of Ceram. The cables to which the present specimens were attached were raised, the one from a depth of 400 fathoms in the Malay Archipelago, and the other from 150 fathoms in the Philippine Islands.

Like so many other deep-sea animals, the polyps are coloured deep-red. This is less pronounced in the case of the Philippine specimen, which was living in shallower water.

Alcyonaria are lowly organized animals, and include such well-known forms as the precious red coral, the soft and comparatively spongy Dead Men's fingers, Sea-pens, and flexible corals or Gorgonians. The significant thing about them and the reef corals, anemones, and most jellyfish is that they are sac-like animals, which have never progressed in bodily form much beyond a certain stage through which the more highly organized animals such as ourselves pass at a quite early stage

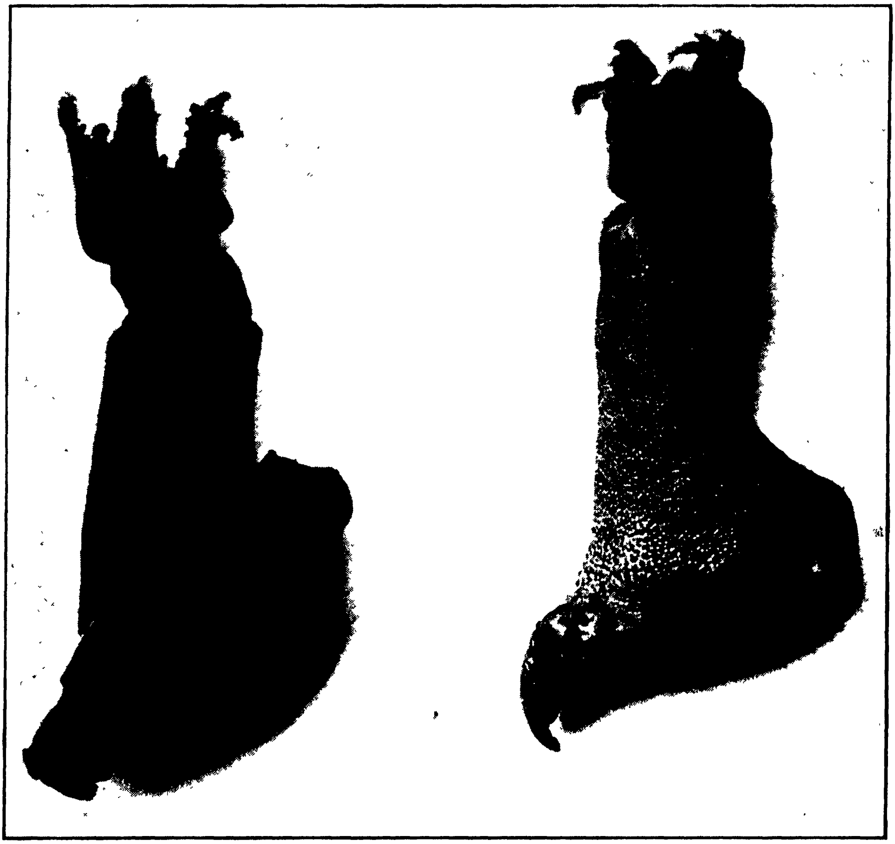


FIG. 1.—*BATHYALCYON ROBUSTUM*, VERSLUYS.

The dark-red Malay specimen on the left from 400 fathoms shows the eight pinnate tentacles, characteristic of Alcyonarian polyps, and the naked basal area, which may be compared with the stalk of *Anthomastus* (Fig. 2). On the right may be seen more clearly the small respiratory sexual polyps covering the column wall of the paler Philippine specimen from 150 fathoms.

of development from the egg. They are all, so far as we know, specialized carnivores, and feed on comparatively small animals, captured and paralysed with their armed tentacles. Whilst the reef corals usually have a solid limy skeleton, *Bathyalcyon* and its nearer allies are protected by layers of separate limy particles or spicules of complicated, yet characteristic, shapes embedded in the flesh.

The particular point of interest about *Bathyalcyon* is that, though at first sight it appears to be a single giant polyp, twice as large as the largest of Alcyonarian polyps hitherto known, closer examination shows that its column-wall is covered with innumerable small respiratory and sexual polyps that have lost all traces of tentacles. It thus differs from *Alcyonium* and its allies in having polyps of two kinds. But it is instructive to compare the colony with those less-specialized dimorphic forms like the species of *Anthomastus*, in which the animal resembles a mushroom. In them there is a supporting stalk and a large expanded top, bearing not one, but a large number of feeding polyps or autozooids, separated one from another by innumerable small, reduced, respiratory or sexual polyps called siphonozooids. It looks very much as if *Bathyalcyon* has evolved by a reduction in the number of autozooids, accompanied by great increase in the size of the only one that remains.

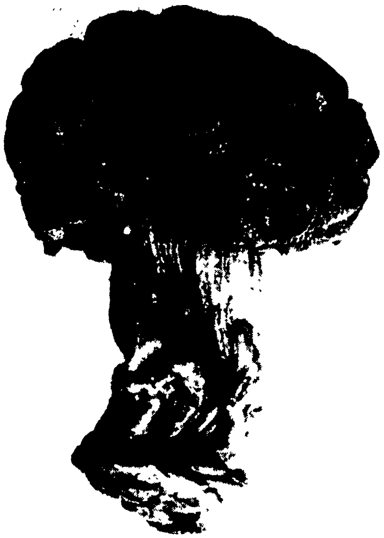


Fig. 2.—*Anthomastus* sp., from 150 fathoms, Philippine Islands.

The small respiratory polyps or siphonozooids can be seen between the larger retracted feeding polyps or autozooids on the head of the pale-red mushroom-shaped polyp-aggregate.

BOOK NOTICES.

An Introduction to Zoology. By ZENO PAYNE METCALF, D.Sc. Pp. xix + 425, with 184 figures and 5 diagrams. (London: Baillière, Tindall & Cox, 1932. 20*s.*)

IN this volume Dr. Z. P. Metcalf selects the rat as his special type around which to weave a general introduction to Zoology. The work is divided into three parts, the first of which consists of two short introductory chapters on "The Field of Zoology" and "The Animal Kingdom." In the first of these the difference between the Physical World and the Biological World is dealt with; then follows a short account of the division of the latter into Animal and Vegetable Kingdoms. A diagram is given of the different metabolism of animals and plants, and the difficulty of distinguishing the two groups is noted, and, in this connection, reference is made to the possibility of creating a third group, the *Protista.* It is to be hoped that we have heard of the *Protista* for the last time.

The second chapter, devoted to the classification of the Animal Kingdom, contains a pictorial chart designed to show the main differences between the Protozoa and the Metazoa and the chief divisions of the latter. The classification is not a modern one, but doubtless will suffice for the purpose of this "Introduction." The statement that the young of the mammalia "are born in a fairly advanced state of development" requires some modification when the marsupials are taken into account; it would have been more satisfactory if the word "usually" had been inserted between the words "are" and "born."

Part II deals with the general morphology and physiology of the rat, with an opening chapter on the structure of animal tissues, followed by another on the habits and natural history of the rat. It seems a matter for regret that this animal should still be referred to the genus *Mus*: surely *Rattus* is now in use all over the world! The external characters are compared with those of other vertebrates, and in this section we read that "in the squirrels and squirrel-like pouched mammals, the tail is used as parachute to aid them in their long leaps." And then follows: "The fox uses its tail in a similar way." This is rather misleading to the student unfamiliar with the vulpine habits.

There are chapters on the integumentary, muscular, skeletal, digestive, respiratory, urinary, circulatory, reproductive and nervous systems, and a well-set-out section entitled "Locomotion in Animals." The author seems a little doubtful about his "creeping animals," whether to call them "Reptatorial" or "Reptitorial." Perhaps "creeping" is as good a word as can be found for these animals, especially as we already have met with, in this chapter, the following divisions of locomotion: ambulatorial, cursorial, saltatorial, scansorial, fluxorial, aerial, fossorial and natatorial; however, there are some who still prefer to call a spade a spade and use the words walking, running, jumping, climbing, gliding, flying, burrowing and swimming or aquatic.

The chapters entitled "Metabolism," "Heredity," "Embryology" and "Animal Behaviour" are all interesting reading, and the last of these is followed by Part III, which deals with "Philosophical Zoology." The first subject tackled under this heading is that of "Distributional Zoology," stress being laid on the "life-zones" of Merriam. Then follows a chapter on "Palaeontology," one on "Organic Evolution" and a concluding chapter entitled "The History of Zoology." In the latter is an unusual portrait of Charles Darwin, depicting him clean-shaven except for "mutton-chop" whiskers.

The only serious criticism than can be made is that the paper the book is printed on is not good enough for a work of this character and some of the illustrations are weak and serve no useful purpose. The subject-matter, however, is set forth in an attractive and entertaining manner and, although one would hesitate to replace any of our standard text-books with this volume, it will certainly be appreciated, and should be carefully read by students of zoology.

Economic Mammalogy. By JUNIUS HENDERSON and ELBERTA L. CRAIG. Pp. x + 397. (London: Baillière, Tindall & Cox, 1932. 26*s.*)

THE authors of this volume, Junius Henderson and Elberta Craig, manage to compress into about 400 pages the chief facts appertaining to Economic Mammalogy. In nearly every subject dealt with they have been successful in gathering together a mass of interesting detail, and the book should be of interest to all students of Mammalogy. Early chapters deal with "The Balance of Nature," "Mammals as a Source of Human Food," and "Mammals as a Source of Valuable Products other than Food." In the latter we once again learn what appalling destruction has, in the past, been allowed to go on in the whaling industry, and no less disturbing figures are given in a later chapter entitled "The Fur, Leather and Hide Trade." In this chapter there are given figures, originally quoted by Osborn and Anthony, which are eloquent evidence of the immense drain made upon fur-bearing animals. In the three years 1919–1921 it was calculated that 23,000,000 mole, 14,000,000 squirrel, 14,000,000 musk-rat, 9,000,000 American opossum, 6,000,000 skunk and many more millions of other skins appeared on the market. We may be willing to spare a few million musk-rats at the present time, but such wholesale destruction as these figures prove can have but one result—extinction.

The chapter dealing with disease carried by mammals should be of interest to many, including lovers of the domesticated cat. This animal is named as being one of the chief agents for the distribution of ringworm, and it is further stated to be a carrier of creeping eruptions. Much of this chapter is filled with facts concerning rabies, tularemia (or rabbit-fever) and bubonic plague; as the volume has admittedly mostly to do with North American mammals, the fact that sleeping sickness is referred to in one line is not, perhaps, a matter for comment.

In a chapter dealing with animals dangerous to man one learns that in the year 1910, in India alone, wild mammals were responsible for the deaths of 2,138 persons. Of this number nearly half were accounted for by tigers; leopards, wolves and bears together making a good second. Protection of useful mammals and control of injurious species are other subjects discussed at some length and make interesting reading.

The second part of this book deals with the economic question from the systematic stand-point; as might be expected the Rodentia occupy the largest part of this section. Considerable space, however, is taken up by the Ungulata and Carnivora, and many of the economic problems pertaining to these groups are gone into in considerable detail.

A fascinating volume and one that should be read widely, as it appeals not only to the worker on mammals, the fauna protectionist, and the student of economics, but also to the "man in the street."

Northward Ho!—for Birds. By Ralph Chislett. Pp. xvi + 188, with 87 figures (1 map and 86 figures on 44 plates). London: Country Life Ltd. 1933. 15*s.*)

THE photographing of birds and their nests is a hobby engaged in by many amateur photographers of both sexes, who, however, for the most part confine their attention to species nesting in the British Isles. In the present work Mr.

Chislett has not been content with birds breeding in this country, but has followed some of our winter visitors to their summer quarters in more northern climes.

The first ten chapters are devoted to the moorland birds of Derbyshire, Galloway, the north of Scotland, and Shetland, and all are illustrated with admirable photographs. But so many books and articles have been written on the same subject that it is almost with relief we turn to the remaining chapters on the author's excursions overseas.

The first country visited was the island of Öland, in the Baltic, where he studied ruffs, black-tailed godwits, and black terns, all birds which formerly bred in East Anglia. The next trip was to Lapland, and here many of our less common birds, such as blue-throats, long-tailed skua, and broad-billed sandpiper, engaged Mr. Chislett's skill, as well as other more familiar species: fieldfares, redwings, and jack snipe. Of the last he has some interesting remarks on the so-called " love song," but is unable to suggest how it is produced.

The author is a very skilled photographer, and his pictures are among the best we have seen, especially the four studies of blue-throats, showing clearly the characteristic markings and form—indeed, everything except colour, of these delightful birds. Mr. Chislett writes in a pleasing style and has interesting observations on the different birds met with. His final chapter should be read by all bird photographers, especially the last paragraph on p. 178. " Photographers can claim to be harmless only if they discriminate and exercise care. I ask my fellow-workers to exercise that care, to be jealous for the welfare of the wild life they study; remembering that no matter how excellent their work, it is of secondary importance to the preservation of a priceless national possession, which once destroyed cannot be replaced; to do not a thing to mar the amenities of the places in which they are privileged to work, and so to preserve the good name of those who follow a great pursuit. . . ."

Modern Theories of Development. An introduction to theoretical biology. By LUDWIG VON BERTALANFFY. Translated and adapted by J. H. WOODGER. Pp. x + 204. (Oxford University Press; London: Humphrey Milford, 1933. 8*s.* 6*d.*)

THE extraordinary progress in theoretical physics which the twentieth century has witnessed has no counterpart in biology. Except in the field of genetics, which is logically the most advanced of biological studies, biological knowledge at present consists of a structureless mass of observations and experiments, to which new facts are daily and almost hourly being added, and of recent years there has been on the Continent and especially in Germany a growing consciousness of the need for principles of synthesis to unify and explain this unwieldy aggregation of empirical data. The interpretations derived from the great biological theories of the nineteenth century—mechanism, vitalism, Natural Selection, Lamarckism, etc.—which were regarded as established biological territory, are now scarcely more assured than the earlier phylogenics; and to-day it is not so much that it is impossible to see the wood for the trees as that biology is all trees and no wood.

This is what von Bertalanffy means by the present crisis in biology, and the first part of his book is devoted to a plea for a concerted effort to create a theoretical biology which shall bear the same relation to descriptive and experimental biology as theoretical physics does to empirical physics. The movement of which the author is a spokesman proceeds from a growing realization of the limitations of the inductive method; and the first step in the desired direction must be a thorough logical overhauling of the current biological theories and their concepts. The author has little difficulty in showing the inadequacy of additive mechanism and the machine theory as modes of interpretation of life, for the assumption that the analysis of vital processes into an indefinite number of separate causal chains of physico-chemical events will yield organism is no longer tenable. The inorganic can be added to the inorganic to infinity and it will never reach organism, for they belong to different orders of reality. Vitalism, on the other hand, while it has done good service in bringing to light the inadequacy of mechanism, has *qua* scientific theory this cardinal weakness, that it postulates the presence of preternatural entities at work in the organism and so puts it ultimately outside the reach of scientific investigation.

Von Bertalanffy believes that the solution is to be found in the teleological or organismic theory. This theory, which has been for many years developed and defended by J. S. Haldane in this country, sees the essential principle of life in the coordination of the various organic parts and processes, in their coherence and their active maintenance as an integral unity expressed in the structure and activity of the organism. Many objections have been raised to this point of view. The instinctive response of many scientific men to any mode of interpretation other than the mechanistic is to start a kind of witch-hunt for what they call mysticism, when they mean obscurantism. Moreover, teleology is treated with the gravest suspicion, and the opponents of the organismic theory claim that to regard the organic processes as being directed to the maintenance of the organism as a whole means the assumption of some mysterious anthropomorphic activity. The fallacy of this criticism lies in the raising of the purposiveness of the organism to the psychological level. Actually for the purposes of biology the whole-making principle of the organism is quite free from hypothesis, whatever its implications may be for theology or metaphysics; and it cannot be over-emphasized that in organismic teleology nothing mental is presupposed.

Again, there is a school who while they have abandoned the old materialistic monism on philosophical grounds remain methodological mechanists, that is to say, they insist that the principles and hypotheses employed in physics are the only possible ones for the purposes of science, and that therefore biology and physics must eventually become one discipline. For most of this school the mathematical study of phenomena is the only one worthy of the name of science. In this relation Bavink's comment on the views and criticisms put forward by von Bertalanffy is worth quoting. " In my opinion they finally and irrefutably dispose of the fatal error, which has injured an epoch of scientific thinking, of equating science in general with mathematical physics. . . . Science is an attempt to bring facts into logical order. Mathematical physics is only one special aspect of this activity."

Organic history and teleology are facts in spite of all the efforts of mechanists to prove the contrary, and as such science must take account of them. It may be a pity that certain aspects of reality do not accord with an epistemological dogma, but this is scarcely a reason for ignoring them or abandoning their investigation. Needham in this country has drawn from the demonstration of *Gestalten*, or integrated configurations, in the inorganic realm the conclusion that the autonomy of biology can no longer be based upon organic wholeness, and that the *Gestalt* point of view renders possible the reduction of biology into physics and chemistry. Needham's conclusion implies that in the nature of its wholeness a physical *Gestalt* is strictly comparable with an organism. This is a very questionable assumption, for there is no evidence that either organic history or organic development has an analogue in the inorganic world. In von Bertalanffy's words : " But this great wonder, the raising of the level of organization, the accumulation and evolution of faculties, etc., is given by no crystal or chemical system. It is not that there is wholeness in the organic realm in general which is decisive, for such is also exhibited by inorganic systems, but the *kind* of totality—the *developing* totality."

The second part of the book is devoted to a critical review of all the current theories of development and to the successful interpretation of the results of recent embryological investigation in the light of the organismic theory. After reading the author's review of the modern researches in embryology, one is left with the impression that the procedure in nearly all cases is the same. The investigator selects a developing egg, usually that of an amphibian, and performs upon it a carefully calculated mutilation, often of an ingenuity to rival that of Heath Robinson, watches what happens, and interprets the result in the light of his preconceived notions of the nature of the organism.

Of the book as a whole it may be said that it should undoubtedly be read by all those who are interested in the probable lines that biology will follow in the immediate future.

MUSEUM NEWS.

Mr. Alfred Cecil Wray retired from the Museum service on June 20, 1933. He began duty in the office on July 11, 1887, and was promoted to be Higher Grade Clerk on April 1, 1922. He was responsible, among other duties, for seeing to the shipping traffic from and to the Museum, and for dealing with matters relating to expeditions. He was Treasurer of the Museum branch of the National Savings Association from 1927 until his retirement.

Mr. Charles Christopher Milan was promoted on June 21, 1933, to the Higher Grade Clerkship in the Office vacated by Mr. Wray. He joined the Museum staff on August 15, 1910, and prior to his transference to the Office in 1921 served in the Library of the Department of Zoology.

* * * * * * * *

In his will Mr. B. H. Soulsby, who died on January 14 (this vol., p. 76), bequeathed, free of all death duties, " To Alexander Cockburn Townsend, M.A., Librarian of the British Museum (Natural History), such of the books in my possession at the time of my death that he may select, and the remainder of such books (exclusive of the Linnean printed matter and manuscripts hereinafter mentioned) to the University of Reading as an addition to the Library thereof. . . . And it is my desire that the said Alexander Cockburn Townsend shall be requested to sort my papers in my room at ' Mentmore ' (or at such other place as I may be living at the time of my death) and to select for the British Museum (Natural History) all Linnean printed matter and manuscripts which he may care to possess, and I give and bequeath the same accordingly, and I request that the said Alexander Cockburn Townsend shall destroy any other papers." Elsewhere in the will he refers to the "Collection of the Works of Linnaeus in the British Museum (Natural History), now the second finest collection in the whole world (after that at Upsala), on which I have expended nearly one thousand pounds."

ACQUISITIONS.

Department of Zoology.

Series of skulls of a small race of elephant from the Gola Forest, Sierra Leone; presented by His Excellency the Governor of Sierra Leone.

Mounted specimen of a Sussex fowl and a pair of abnormal (markedly palmated) antlers of a samban; presented by the Rowland Ward Trustees.

Collection of North American ungulate heads shot by the late Mr. Flemming Crooks; presented by Lady Taylor, Mr. J. Kirke Crooks, and Mr. A. Crooks.

Mounted specimen of snow leopard shot by the late Col. Stephen Frewen in Ladak in 1896; presented by Lieut.-Col. L. Frewen.

Mounted specimen of curly-coated retriever; presented by Mr. B. Hawes.

Mounted specimen of the " Blue Beveren " breed of rabbit; presented by the National Beveren Club.

Two specimens of a rare East African scaly-tail; presented by Mr. R. E. Moreau.

Series of stereoscopic radiographs of mollusc shells for exhibition; presented by Dr. G. H. Rodman.

Collection of 668 birds, representing 250 species, from South Africa, mostly from eastern Natal; purchased.

Department of Entomology.

An important collection, numbering about 40,000 specimens, of Coleoptera belonging to the family Curculionidae; deposited on permanent loan by the Hawaian Sugar-planters' Association, Honolulu.

The collection of insects, mainly butterflies, moths, and beetles from Brazil, made by the donor's brother, the late E. D. Reynolds; presented by Miss Jean Reynolds.

Department of Geology.

Large collection, mainly of Silurian fossils from England and Norway; presented by Miss M. S. Johnston.

Large collection of fossil invertebrates, mostly Silurian coelenterates and brachiopods from England and Scandinavia; presented by Miss M. C. Crosfield.

Department of Mineralogy.

Portion of a meteoric stone which fell on July 8, 1932 at Kahrapar, Jaunpur, United Provinces, India; presented by Mr. H. Minson, Collector of Jaunpur.

Wind-worn lump of clear, transparent, pale yellowish-green silica-glass, resembling bottle-glass, from the Libyan Desert; presented by the Survey of Egypt.

Native Indian pair of scales for weighing gem-stones, with sets of weights of agate and seeds; presented by Mr. E. Hopkins.

Department of Botany.

Herbarium of about 20,000 specimens, including 6000 Charophyta and 11,000 British flowering plants, mosses, and sea-weeds; bequeathed by Mr. James Groves.

Collection of over 1,200 Mesopotamian plants made by the donor and others while on active service; presented by Dr. R. J. D. Graham.

Collection of about 900 specimens of plants made by Mr. A. W. Exell, Assistant Keeper, in company with Mr. W. H. T. Tams, Assistant Keeper, Department of Entomology, in the islands of the Gulf of Guinea; the cost was met by grants from the Percy Sladen Trustees and the Godman Exploration Fund.

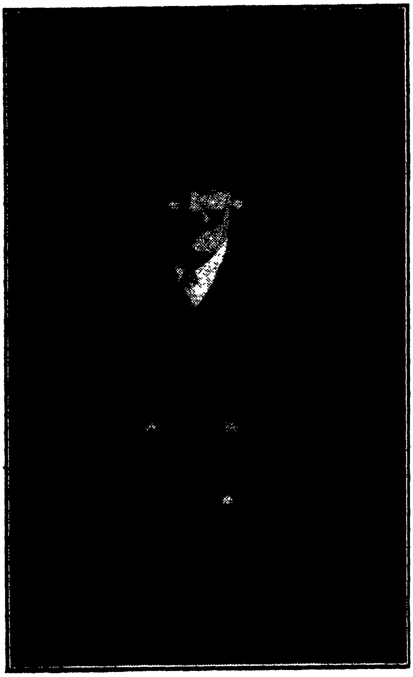
British herbarium, of about 6000 specimens, formed by the donor's father, the late C. A. Wright, presented by Miss I. M. Wright.

Plants collected in the West Indies, presented by Dr. A. B. Rendle, F.R.S.

OBITUARY.

BARON NOPCSA.

The sudden death of Franz, Baron Nopcsa, Ph.D., in Vienna on April 25, when he was within but a few days of his fifty-sixth birthday, has deprived geological science, and particularly palæontology, of one of its most distinguished followers. He was recognized as one of the leading vertebrate palæontologists and much of his work on fossil reptiles bears the stamp of genius. Although hampered by severe illness since the end of the War, he never abandoned his researches nor lost interest in his work. For some years he was Director of the Geological Survey of Hungary and of the Museum associated with it. At the time of his death he was a Foreign Member of the Geological Society of London and a Corresponding Member of the Zoological Society. Throughout his life he was keenly interested in the British Museum (Natural History) and paid it many visits, during which he seldom failed to make some additions to the Library or the Collections. His important collection of fossil reptiles was purchased by the Trustees in 1923. In 1926 he spent some time working in the Geological Department and described the Canadian armoured dinosaur now known by his name of *Scolosaurus cutleri*. His last visit was for a fortnight in February 1931, when the accompanying photograph was taken by Col. W. P. C. Tenison.



Baron Nopcsa.

A man of tremendous energy, it is only natural that he should have had his detractors, and that, having a large scientific output, he should have made occasional mistakes; but his many Museum friends will remember him for his wide culture, for his pleasant and courtly manner, and for his conversation, always witty and charged with stimulating ideas.

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DUGONGS FROM MAFIA ISLAND AND A MANATEE FROM NIGERIA.

By GUY DOLLMAN, B.A., Assistant Keeper, Department of Zoology.

THE Museum has recently received as a donation from Mr. B. W. Savory two complete skulls and a lower jaw of the Dugong from Mafia Island, Zanzibar Archipelago. These skulls were obtained from dugongs netted by native fishermen at Kilindoni, Mafia Island, in the latter part of 1930. Photographs of these dugongs were taken by Mr. Savory, and three of them are here published for the first time (Figs. 1–3).

The dugongs, together with the manatees and Steller's sea-cow, comprise, with the fossil forms, the order Sirenia. Sirenians, or sea-cows, are exclusively aquatic, inhabiting coastal waters and rivers. In shape these animals conform to the typical aquatic outline, the body being more or less fish-shaped, the fore-limbs being modified to form flippers, the tail flattened like that of a whale, and, externally, there are no hind-limbs. The nostrils are placed on top of the head, and both the eyes and the ears are small, there being no external ear developed. The bones of the skeleton are extremely dense and heavy; there are no collar-bones, and the pelvis is quite small and vestigial.

The three types of Sirenians, the dugong, the manatee, and Steller's sea-cow, are regarded as representing three family groups, the Halicoridae, the Trichechidae (formerly Manatidae) and the Hydrodamalidae (formerly Rhytinidae) respectively. The dugong (*Halicore*) is an inhabitant of shallow seas and coastal rivers between north-west Australia and the Red Sea. The nostrils are more elevated than in the manatee and nasal bones are not developed. There are seven cervical vertebrae, nails are not developed on the flippers and the tail is notched in the mid-line and pointed laterally. The manatee (*Trichechus*) is an inhabitant of the coastal rivers of eastern tropical America and western tropical Africa. The nostrils are not so elevated as in the dugong, and nasal bones are developed. There are six cervical vertebrae, nails are usually present on the flippers, and the tail has no central notch, being rounded and shovel-shaped. Steller's sea-cow (*Hydrodamalis*) was formerly an inhabitant of the waters around Behring Island and Copper Island in the north Pacific. In the adult specimens of Steller's sea-cow there are no teeth, their place being taken by horny plates. The number of cervical vertebrae in this animal numbered seven, the flippers were relatively small, and the tail had two lateral, pointed lobes. Further, the head was small compared with the large size of the body, this species being by far the largest member of the order, sometimes reaching a length of 25 feet. It was

FIGS. 1–3.—DUGONG, TAKEN AT MAFIA ISLAND BY MR. B. W. SAVORY.

discovered by Behring and Steller when they were wrecked upon Behring Island in 1741, and was supposed to have become extinct in 1768. Its extermination was brought about by Russian traders, and its final extinction was accelerated by its large size, slow movements, and fearlessness of man.

Sirenians would appear to use the tail exclusively when swimming, the flippers being used for feeding purposes. These animals appear to pass the whole of their lives in the water, their food consisting entirely of aquatic plants, upon which they feed while beneath the surface. The dugong has a habit of raising its head out of the water, and this habit has possibly given rise to the legends concerning mermaids. The so-called mermaids which are exhibited at places of amusement at Aden and elsewhere are nearly always either combinations of monkeys and fishes or else dugongs which have been doctored so as to make them as human-looking as possible. This is arrived at, as a rule, by blocking up the apertures of the ears, eyes, and nostrils, and building up a new face on the muzzle or disc. These fakes are sometimes very cleverly carried out, and it is almost impossible to detect the true position of the animal's eyes, ears, and nostrils. As a rule, the bristles of the muzzle are removed and the human effect is heightened by the insertion of glass eyes into the artificially constructed eye-sockets. The flippers are sometimes skinned so as to show the skeleton, thus producing a somewhat human-like hand which adds considerably to the general effect of the faked specimen.

The disc or muzzle is divided into two halves by a vertical cleft, and the lower portion is covered with short, blunt spines. Above this area are a number of longer and finer bristles, possibly of a sensory nature. The nostrils, which are situated outside the disc on the top of the head, are crescentic in shape and apparently retractile. The eyes are small, deeply-set, and black in colour, and the ear aperture is quite minute, being less than half an inch in diameter.

Mr. Savory's two skulls are those of an old male (Fig. 4) and an adult female dugong (Fig. 5). The tusks in the male sex, when the animal is adult, are large and massive teeth, extending well out beyond the alveolar border. These tusks represent the second upper incisors, and are comparable to the tusks of an elephant. The first pair of incisors, which remain quite small, are shed early in life, and their alveolar cavities are encroached upon by the large second incisors, which have persistent pulps and bevelled cutting edges. In the female sex the tusks are retarded in their growth and never emerge beyond the gum, remaining hidden in the alveolar tissue throughout life; in this respect these Sirenians resemble some Indian elephants in which the tusks in the females never grow beyond the alveolar border.

Another resemblance to the Proboscidea is to be found in the method of succession of the molar teeth, this being more horizontal than vertical. The first three cheek-teeth are shed one after another, leaving the hinder pair only in old age. Occasionally six cheek-teeth are developed on each side of each jaw. The teeth are roughly circular in section except the last molar, which, as it wears away, gets more and more bi-lobed, until finally, in old animals, this tooth presents a figure of 8-like section, the tuberculate surface of the young tooth being worn right away and the tooth becoming a bi-lobed, flat-surfaced grinder.

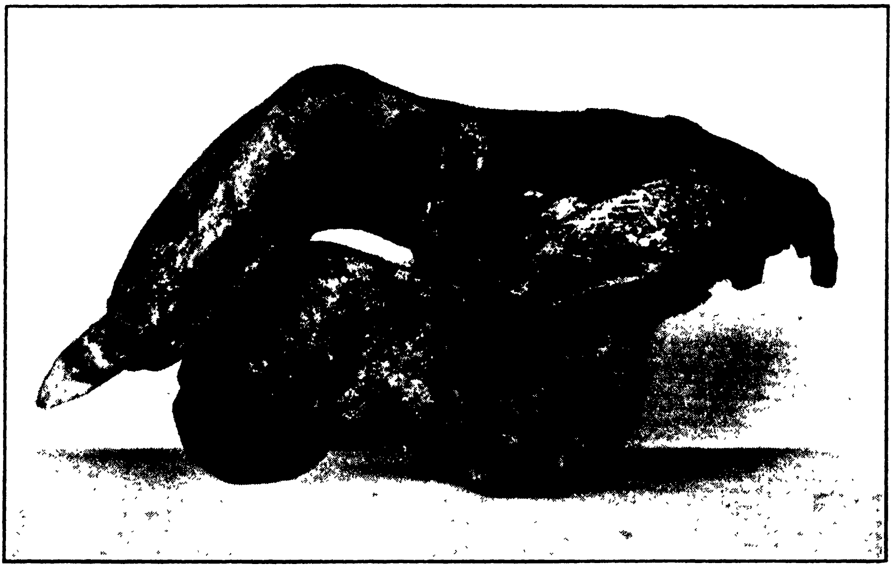


FIG. 4.—SKULL OF MALE DUGONG (LATERAL VIEW).
Length 15 ins.

The grinders in the lower jaw are of similar form, and succeed each other in a similar manner to those of the upper jaw. In front of the lower jaw there may be observed four alveolar pits in each half of the jaw (Fig. 6), which in early life accommodated the lower incisors or incisor and canine teeth. These teeth would appear to be quite functionless, since throughout their existence they are hidden away below the horny plate which covers the lower jaw, and are absorbed at an early age. These alveolar cavities would then seem to take upon themselves the function of

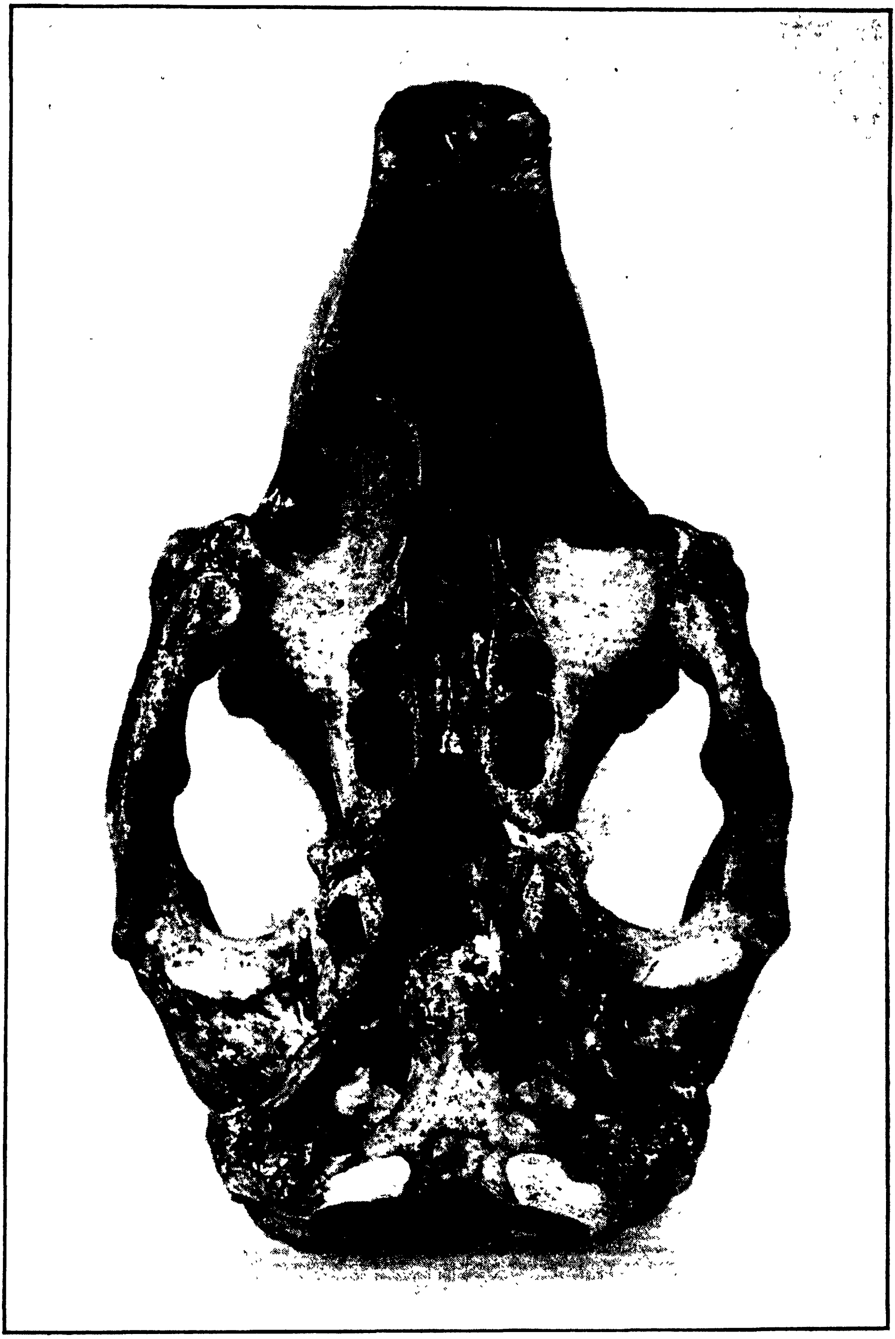


FIG. 5.—SKULL OF FEMALE DUGONG (VENTRAL VIEW).
Length 15 ins.

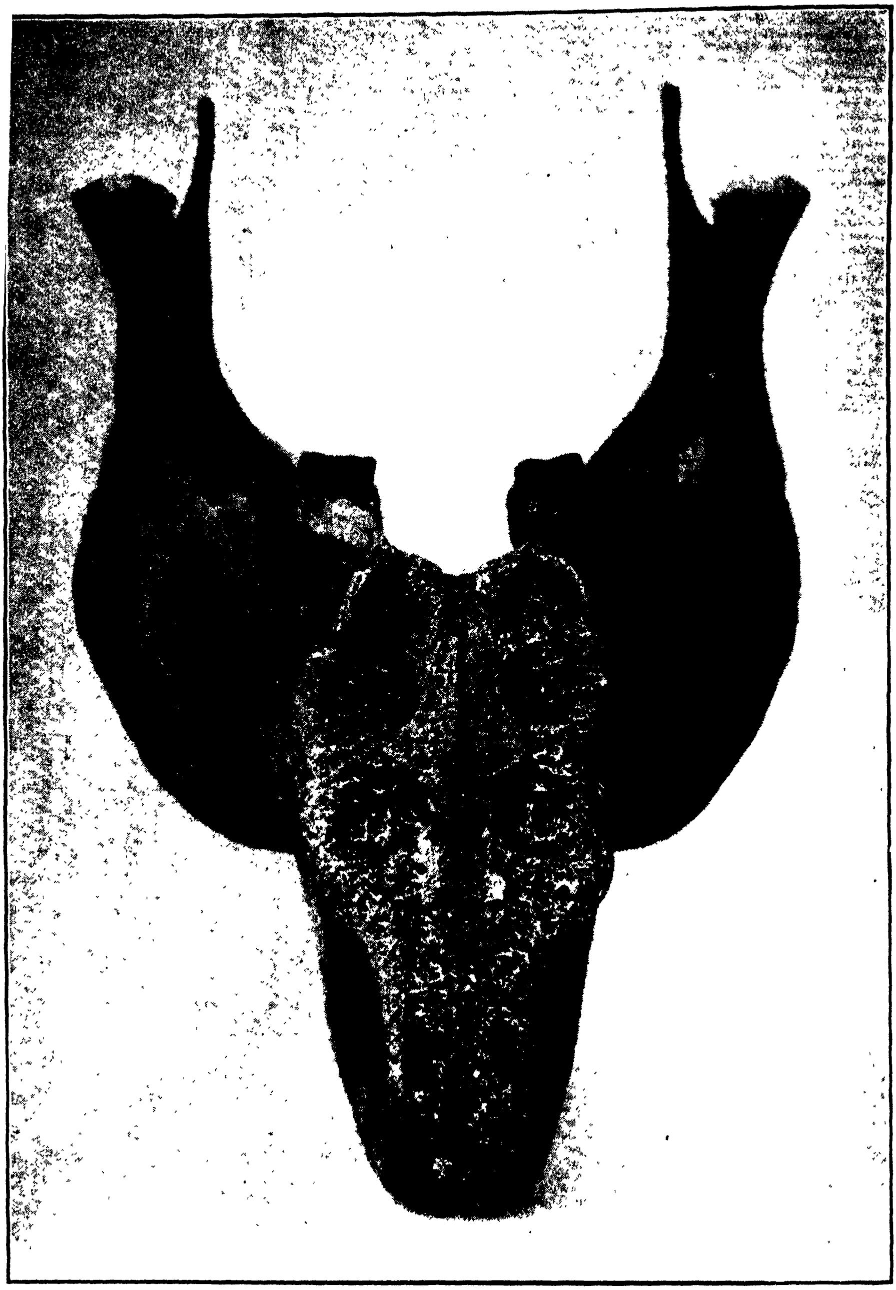


FIG. 6.—LOWER JAW OF DUGONG, SHOWING ALVEOLAR CAVITIES OF FUNCTIONLESS FRONT TEETH.

Extreme length 12 ins.

anchoring this plate to the lower jaw, as ligaments have been observed extending from the cavities into the tissue of the plate.

Mr. Savory reports that he gathered from the natives that the dugong swims in about eight fathoms of water, and he expresses surprise that such a helpless creature can survive in the shark-infested waters surrounding Mafia Island. The flesh is said to be superior in flavour to the usual East African beef and finds a ready sale locally. The largest dugong captured round the island measured 10 feet 2 inches in length, the measurement being taken from the anterior points of the tusks to the notch of the tail in a straight line. The intestines of this specimen were extremely long, measuring some 132 feet in length. In two specimens recorded by Owen this measurement is given as 115 and 101 feet. Mr. Savory in his notes upon these animals remarks that they are probably more common around Mafia Island than anywhere else in East Africa, and that they are usually caught during the monsoon. Mr. Boden Kloss, in a paper published in 1905 on the dugong, reports that in the Gulf of Manaar the dugong would appear to be changing its habits to a certain extent, as it has ceased to frequent shallow waters except when wounded or sick. The same author reports that off the coast of Queensland the dugong is found in water of from 10 to 12 fathoms.

A manatee (Fig. 7) was recently presented to the Museum by Mr. F. J. Woods, who collected it in the Izichi river, Anambra Creek, Southern Province of Northern Nigeria, on November 12, 1932. This specimen measured in total length (straight line) 11 feet and had a girth of 7 feet 5 inches. It was reported to be elephant-grey in colour, the body being very sparsely covered with black hairs; the whiskers and eye-lashes were black. The specimen bore two scars on its body which were probably the results of old spear-thrusts; the natives maintain that crocodiles never attack these animals. A thick layer of fat was found to be directly underneath the skin, and in the middle portion of the body this layer is said to have been four times as thick as the muscles. The flesh has the appearance of pork, and tastes rather like a mixture of pork and veal.

Hunting the manatee in this portion of Nigeria is a regular occupation, and the manatee-hunter follows no other trade. The work is carried out at night, and usually the animals are attracted by a bait of grass and then speared when taking the bait, their position being indicated to the hunter by the movements of saplings stuck into the mud and forming a semi-circle round the bait. The spear has a stout, barbed, detachable head attached by a long rope to a thick shaft, to the other end of which is fixed a large piece of wood which serves both for weighting the spear and as a visible float after a successful throw. The shaft quickly becomes loose from the firmly embedded head and rises to the surface as the rope unwinds, and is watched and followed by the hunter until the animal is so exhausted that it can be drawn to the bank and given a final stab. This is usually deferred until after daybreak, or until the beast is *in extremis*, as great havoc can be wrought to both canoes and men by these animals' powerful flippers and tails.

Fig. 7.—Manatee.
Specimen and photograph presented by Mr. F. J. Woods.

One manatee a month is considered good hunting, and as the "beef" of a single beast realises from £5 to £8, the occupation of the manatee-hunter is undoubtedly remunerative. According to the natives, manatees feed only on grass, but Mr. Woods reports having seen them several miles inside the flooded area of the Anam forests, where grass is non-existent or very scarce. It seems possible that they browse during these flooded periods when they have the run of the forests to themselves. It would appear that these animals can remain under the surface of the water for quite a lengthy period; the natives believe that they can remain under indefinitely. When conditions permit, the manatees delight to remain on the surface, but when danger threatens they immediately submerge.

Mr. Woods in his report on this animal states that to many tribes the manatee is "ju-ju." The Abos believe that it is certain death even to see one, and the same belief seems to exist amongst the Asaba and other tribes inhabiting the banks of the Niger. All the regular hunters of the manatee would appear to be Haussas, and when a carcase of one is being towed in, a warning drum commences to beat a special rhythm, which continues until the beast has been cut up. If killed at a distance or after a prolonged struggle, it sometimes happens that it is evening before the body arrives at the bank of the river, and then it is necessary for the drumming to continue all night until the carcase is cut up the next morning.

Manatees would appear to be commoner in Nigeria than is usually thought to be the case. They are known to occur in the Niger, and are probably also numerous in most of the other large rivers in Southern Nigeria. There seems to be little fear of this species being killed off in the near future, since firearms have been found to be useless against it, and the methods of hunting and killing must remain the same as those which have been used from time immemorial.

A VISIT TO THE ISLANDS IN THE GULF OF GUINEA.

By W. H. T. TAMS, Assistant Keeper, Department of Entomology.

THE fact that we are natives of a group of islands does not seem to have lessened in any way our interest in the other islands of the world. On the contrary, a spirit of roving and seafaring has been engendered within us, partly as a result of our isolation and partly as a result of the invasion of our shores by peoples who would never have found and settled in this country had they not been wanderers themselves. And so, with such blood in our veins, it is not to be wondered at that when we come under the influence of the necessary stimulus, we have no hesitation in responding to the call. In these days the opportunities for new discoveries along the lines of pure exploration steadily decrease, but there is no lack of opportunity in the realm of natural history, and there still remain vast fields of unexplored territory in the domains of botany, zoology, and geology to attract those who feel any desire to add by their own efforts to the sum of human knowledge.

There exist those who urge that we need be in no hurry to carry out expeditions to remote corners of the earth, especially in these times of acute economic depression, and this certainly is not an unreasonable point of view. Against it I would simply range the fact that there are parts of the world, in particular such islands as Mauritius, São Tomé, Principe, etc., possessing peculiar botanical and zoological features, which are in danger of being destroyed as the result of the encroachment of cultivation. In the case of the three islands named the original forest has already suffered severely, and it was with the object of attempting to gather a few of the treasures of the islands in the Gulf of Guinea, namely Fernando Po, Principe, São Tomé, and Annobon, that the expedition here described was organized. The bulk of the expense involved was borne by the Percy Sladen Memorial Fund and the Godman Exploration Fund, and to the Trustees of both funds I wish here to express publicly my personal gratitude and that of my colleague and companion on the trip, Mr. A. W. Exell.

An expedition, undertaken by the late T. Alexander Barns at the end of 1925 and during the first half of 1926, produced results which indicated that further efforts to increase our knowledge of these islands would certainly be profitable, and the need to have more material from them in the British Museum collections with the view of assisting us in making comparative studies of the flora and fauna of the different parts of Africa, led the author to organize this new expedition. Mr. A. W. Exell accompanied me as botanist and, I may add, linguist; for his perseverance with Portuguese and his knowledge of Spanish frequently helped to carry us through difficult situations. In addition, although I undertook the general photography, the results he obtained with his Kodak are in no way inferior to my own photographs, and he often obtained better pictures.

Granted five months' special leave by the Trustees of the British Museum, we left Tilbury on October 1, 1932, for Lisbon, where we were to catch the Portuguese boat "Mouzinho" for São Tomé. We made the necessary arrangements for our departure on October 8, and, after a flying visit to Cintra, left to carry out our plan to spend a day or two at the old University town of Coimbra, visiting the Botanic Gardens and Institute and the Museum of Natural History, at the invitation of Prof. L. W. Carrisso. Senhor A. F. de Seabra very kindly showed me the entomological collections, including material from the Portuguese colonies that we were to visit. We shall never forget the kindness of our friends at Coimbra, nor the memorable trip we made in the company of Prof. and Madame Carrisso to the historic beauty spot of Bussaco. On our return to Lisbon we called on the Agent-General for the Portuguese Colonies, to whom we are greatly indebted for much valuable assistance. He generously presented us with fine maps of São Tomé and Principe, and later took us to the Industrial Exhibition, where we saw amongst other things interesting exhibits from the Portuguese colonies.

We sailed that evening, much relieved to be actually afloat after the usual trying experiences over tickets and customs. Even when everything has been carefully arranged and every facility exists for smoothing one's way, it is astonishing how trivial obstacles seem unexpectedly to arise. I received a letter from the Secretary to the British Embassy at Lisbon informing me that the Ministry of the Colonies had been good enough to issue the necessary instructions to the Colonial authorities to grant us special customs and other facilities, which had been requested on our behalf by His Majesty's Embassy on the instructions of the Foreign Office. Before leaving England we had been informed that similar facilities had been granted by the Spanish Colonial authorities; so we felt that nothing had been left undone and we could go forward with light hearts: our confidence was fully justified.

Sunday, October 9, saw us well on the way to Madeira in stormy weather, which gave place to calmer and brighter conditions on the following day, during the evening of which we reached Funchal. The view of the island at sunset was so beautiful that merely recalling it stirs within one a great desire to see it again. We were only able to see the sparkling lights of the town, as it was dark by the time we dropped anchor, and, as our stay was to be short and that during the night, we thought it wiser, as neither of us knew the place, to refrain from going ashore. The following day broke fine and bright, but our view of Teneriffe in the late evening was not enhanced by the presence of mist. Three days later we passed close to Cape Verde, and Dakar came into view not long afterwards. On Sunday, October 16, we rose from breakfast to find ourselves passing the old British colony of Sierra Leone in a glassy sea, which was to be for us typical of this "corner" of the Atlantic. There remained but the five days' run to São Tomé, during which we gradually diverged from the coast of Liberia, and only saw land again as we neared our destination. As neither of us had been in the tropics before, our feelings can better be imagined than described. Although the island of São Tomé has been so extensively cultivated that the verdure which meets the eye on a first approach is almost entirely that of plantations, yet it is a stirring and inspiring sight.

The Captain of the "Mouzinho," who spoke excellent English and to whom we are greatly indebted for many kindnesses on the voyage, advised us to wait until he could hand us over to the agent of the Companhia Colonial de Navegação, and this resulted in our arriving at a hotel at 11.45 p.m. The first hotel to which we were conducted having no accommodation, we were taken to another, and we realized as soon as the electric light was switched on that we were in the tropics; for away scampered in all directions huge cockroaches, and large ants were to be seen running across the floor. By 12.30 a.m. our landlord with many apologies had fixed us up with a couple of beds without mosquito curtains, and, as we had only our hand luggage and our own curtains were still on the ship, we had to resign ourselves to taking the risk of getting malaria right at the start of our tropical experience. After a few desultory and hopeless attempts to rid the room of mosquitoes we went to sleep with them buzzing about our ears.

Next morning we were not filled with any particular anxiety to eat breakfast in the dining-room of our hotel. I am sure that I shall be forgiven for a slight exaggeration when I say that a glimpse into the *sala de jantar* on the previous night had disclosed to our astonished gaze dirty table-cloths with hordes of disappearing cockroaches, disturbed by the sudden lighting-up of the room. However, anticipating a strenuous day's work,

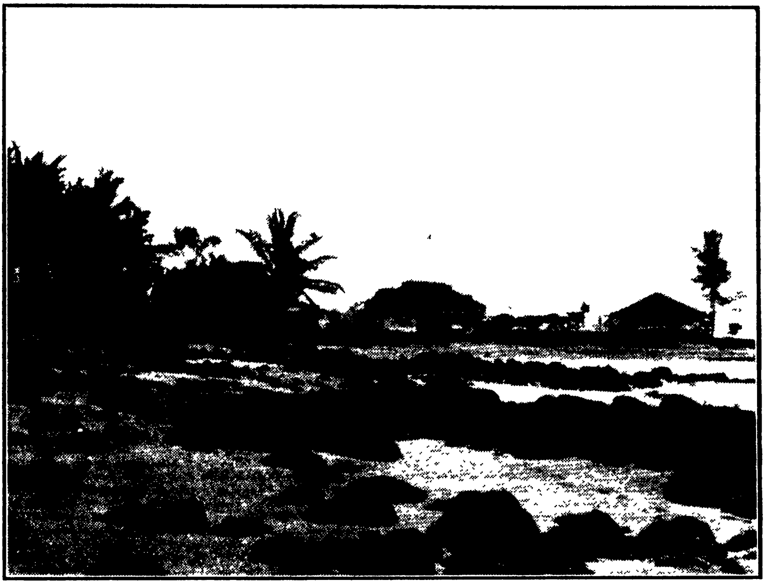


FIG. 1.—CABLE STATION (centre of picture), SÃO TOMÉ.

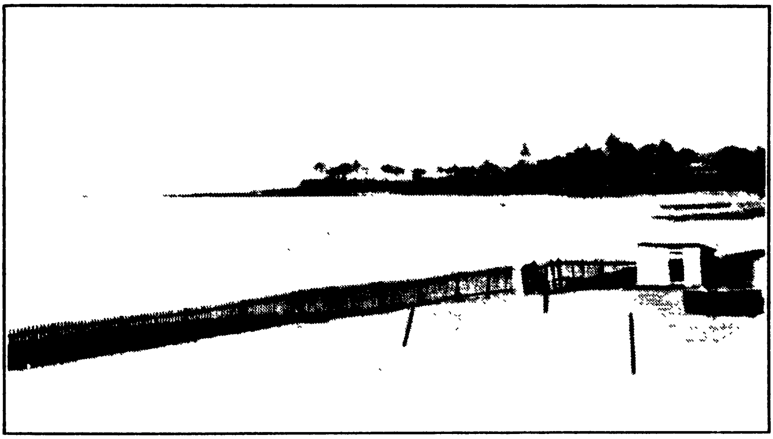


FIG. 2.—VIEW, LOOKING SOUTH-EAST, FROM CABLE STATION, SÃO TOMÉ.

we set to and tackled the coffee and rolls with more courage and endurance than enjoyment. After a visit to the agent of the Shipping Company, we hired a car and drove round to the Cable Station (Figs. 1, 2) to make the acquaintance of Mr. L. P. Cauvin, the Superintendent, to whom we had an introduction. From that moment, so far as concerned the Portuguese islands, any difficulties that might have been lying ahead of us vanished into thin air, and it will be difficult for us ever to express adequately our gratitude to the only Englishman—or rather Irishman, if that be not too Irish—in São Tomé at the time of our visit. Mr. Cauvin spared nothing in his efforts on our behalf, and I can only express the hope that any English visitor to São Tomé in the future will find in his successor such another friend. Until we finally left the Portuguese islands for Fernando Po, we were always sure, not only of a warm welcome at the Cabo Submarino, but also equally certain of every facility for storing, packing and unpacking, and handling our baggage, or arranging for our future movements.

FIG. 3.—MANGROVES, SÃO TOMÉ.

Mr. Cauvin without delay presented us to His Excellency the Governor of São Tomé and Principe, who at once gave instructions for all Customs formalities to be dispensed with, and offered to assist us further in any way that lay in his power.

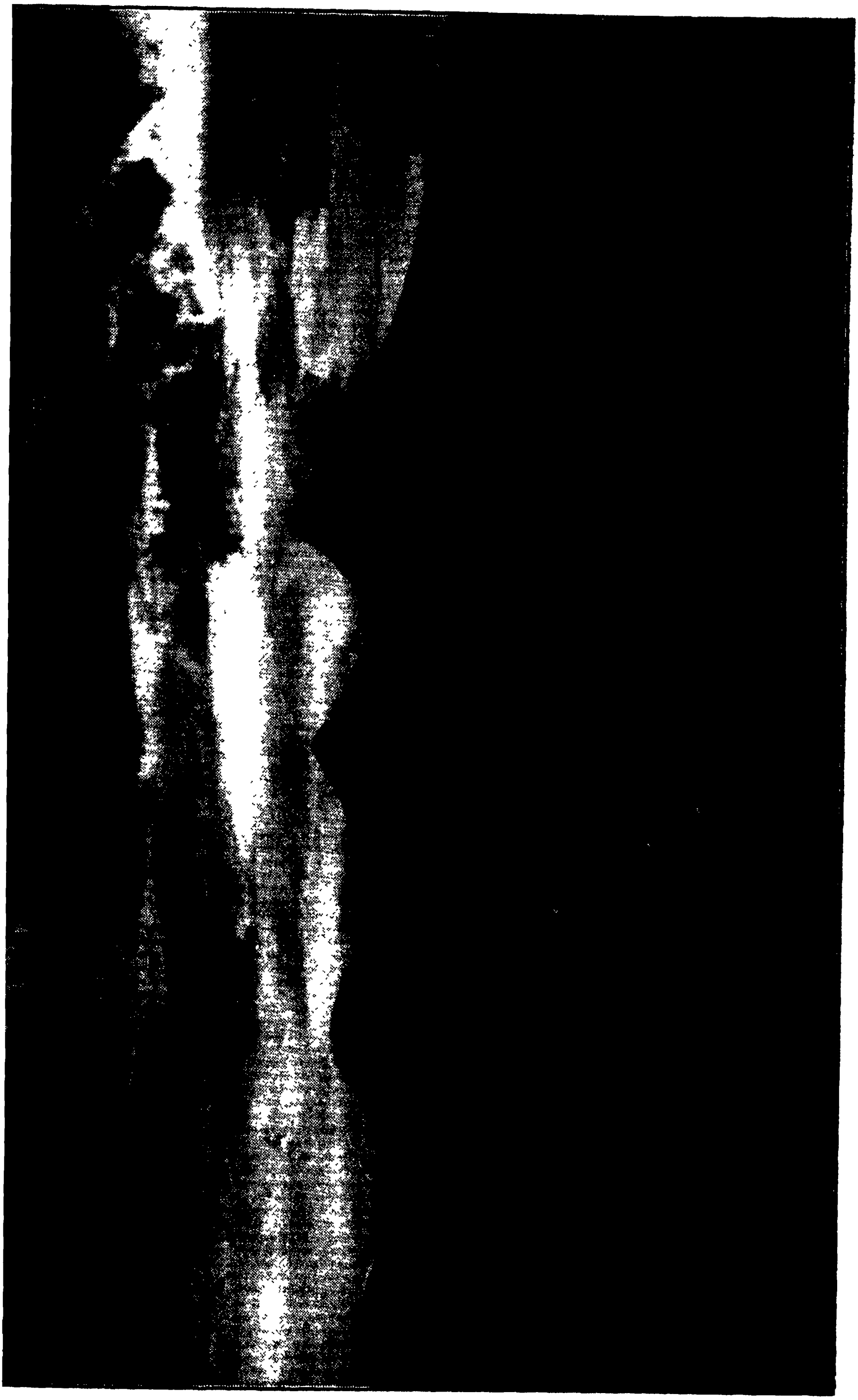
Fig. 4.—Mr. A. W. Exell collecting Plants by the Sea, São Tomé.

Fig. 5.—Our House at Vanhulst, São Tomé.

The same evening Mr. Cauvin took us for a trip by automobile along the shore road to the fishing village of Pantufo, and on the way we crossed an almost dried-up stream, with mangroves on its banks and many climbing perch on the mud beneath the mangroves (Fig. 3). On the following day we made two trips along the beach road in order to sample the plants and insects, but did not find very much (Fig. 4). In the afternoon we met Mr. W. G. van Leeuwen, Vice-Consul for the Netherlands, Administrateur-Directeur de La Société Anonyme "Amparo," and to him we owe a great debt of gratitude for allowing us the use of the little house of Vanhulst (Makambrará) (Fig. 5), a *dependencia* of the Roça Zampalma (or Jamar, as it is apparently sometimes called).

On the Sunday we went by automobile to the Roça Rio do Ouro, where we had the good fortune to meet Senhor Rafael Oliveira and Dr. Eduardo Nogueira de Lemos. We regretted very much that we were unable to spend more time in some of the low-lying country such as that in which the Roça Rio do Ouro was situated, or the country to the south and west, particularly around Porto Alegre and the Ilha das Rôlas. But we had to bear in mind two things. First, in these islands one is often almost entirely dependent on the generosity of the owners of the roças or their representatives for any transport beyond the ends of the roads; in the case of Zampalma the motor road only took us to 2000 feet, and from Zampalma to Vanhulst (4000 feet) there was only a good mule-track (Fig. 6). Second, it is very necessary to accept offers of assistance without hesitation. One soon finds out that an ambitious programme is exceedingly easy to draw up in England; but, when one is faced with transporting heavy packages up mountains, one cannot afford to miss opportunities. The result in our case

Fig. 6.—Mule-track to Vanhulst, São Tomé.



THE HOME OF THE EASTERN GORILLA: BIRUNGA MOUNTAINS.

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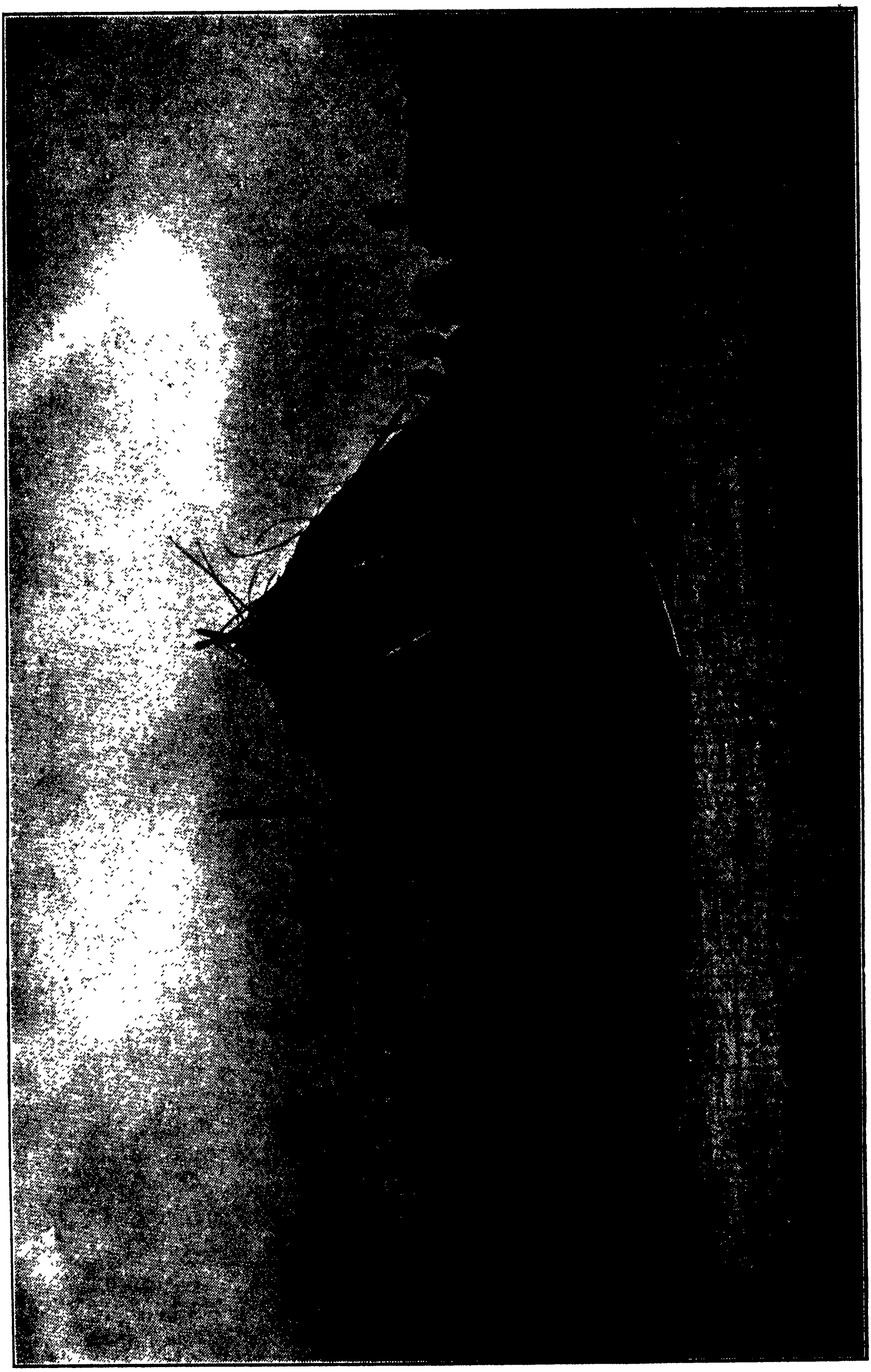

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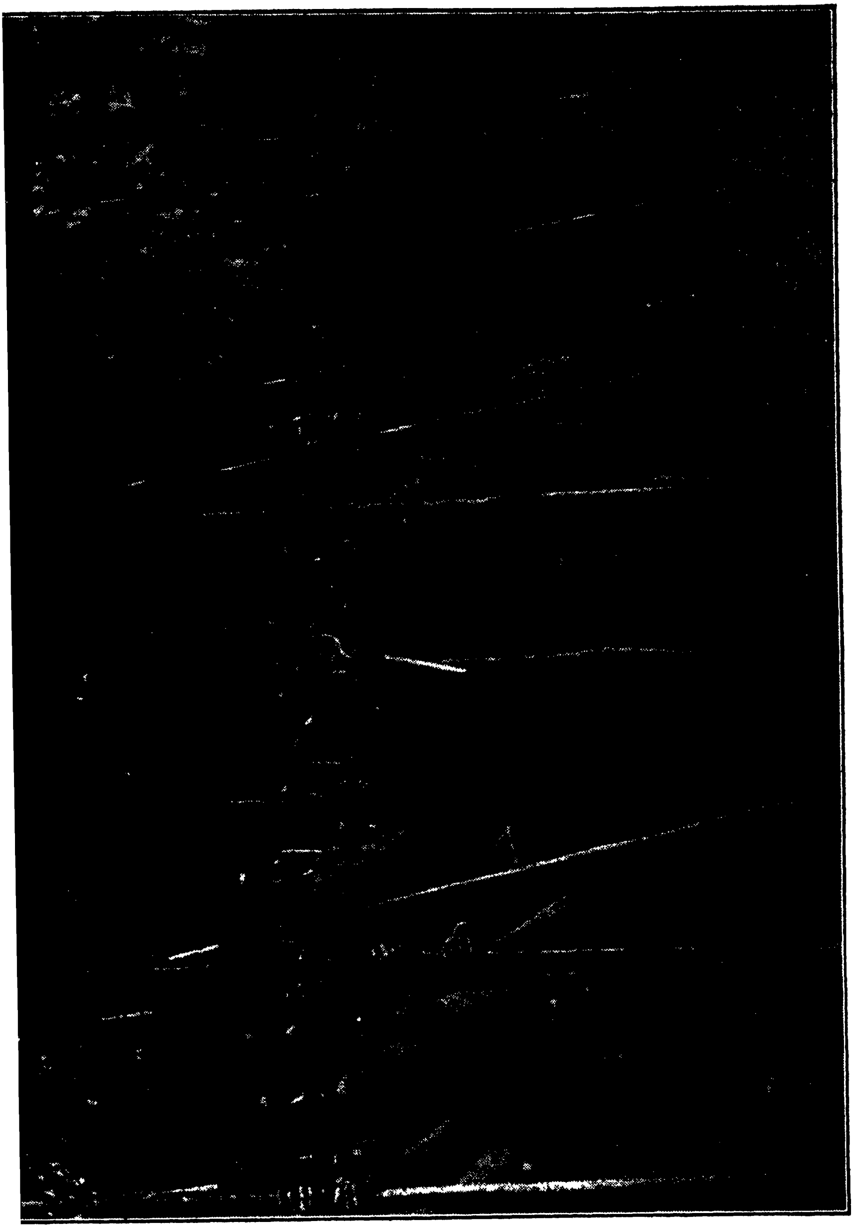
THE HOME OF THE EASTERN GORILLA: NATIVE HUT ON THE ALUMBONGO RANGE.



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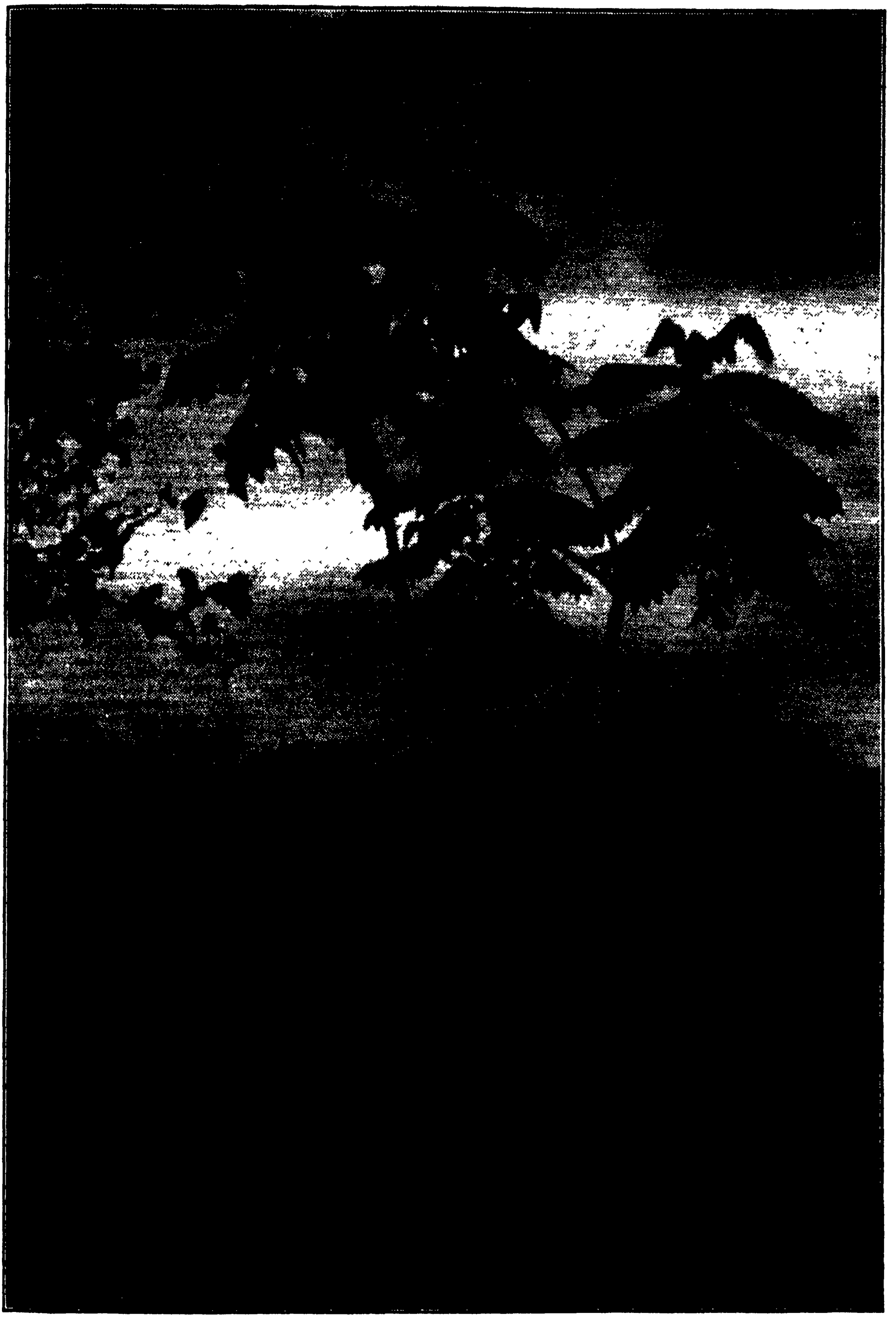
THE HOME OF THE EASTERN GORILLA: PARTY OF ALUMBONGO NATIVES.

Copyright Photograph by Lady Broughton.

THE HOME OF THE EASTERN GORILLA: LOBELIAS AND BEARD-MOSS.



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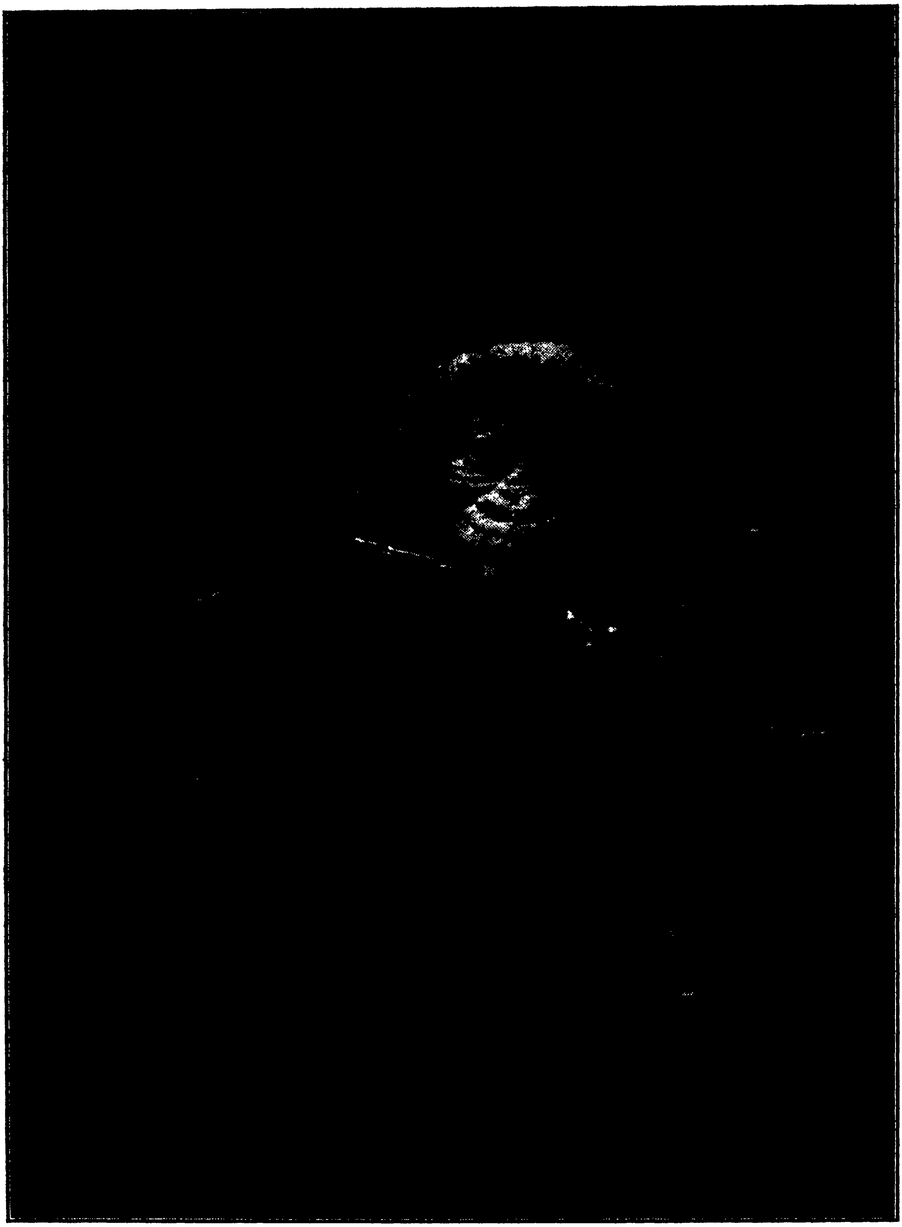
THE HOME OF THE EASTERN GORILLA: FOREST SCENE IN THE ALUMBONGO RANGE.



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THE HOME OF THE EASTERN GORILLA YOUNG MALE GORILLA.

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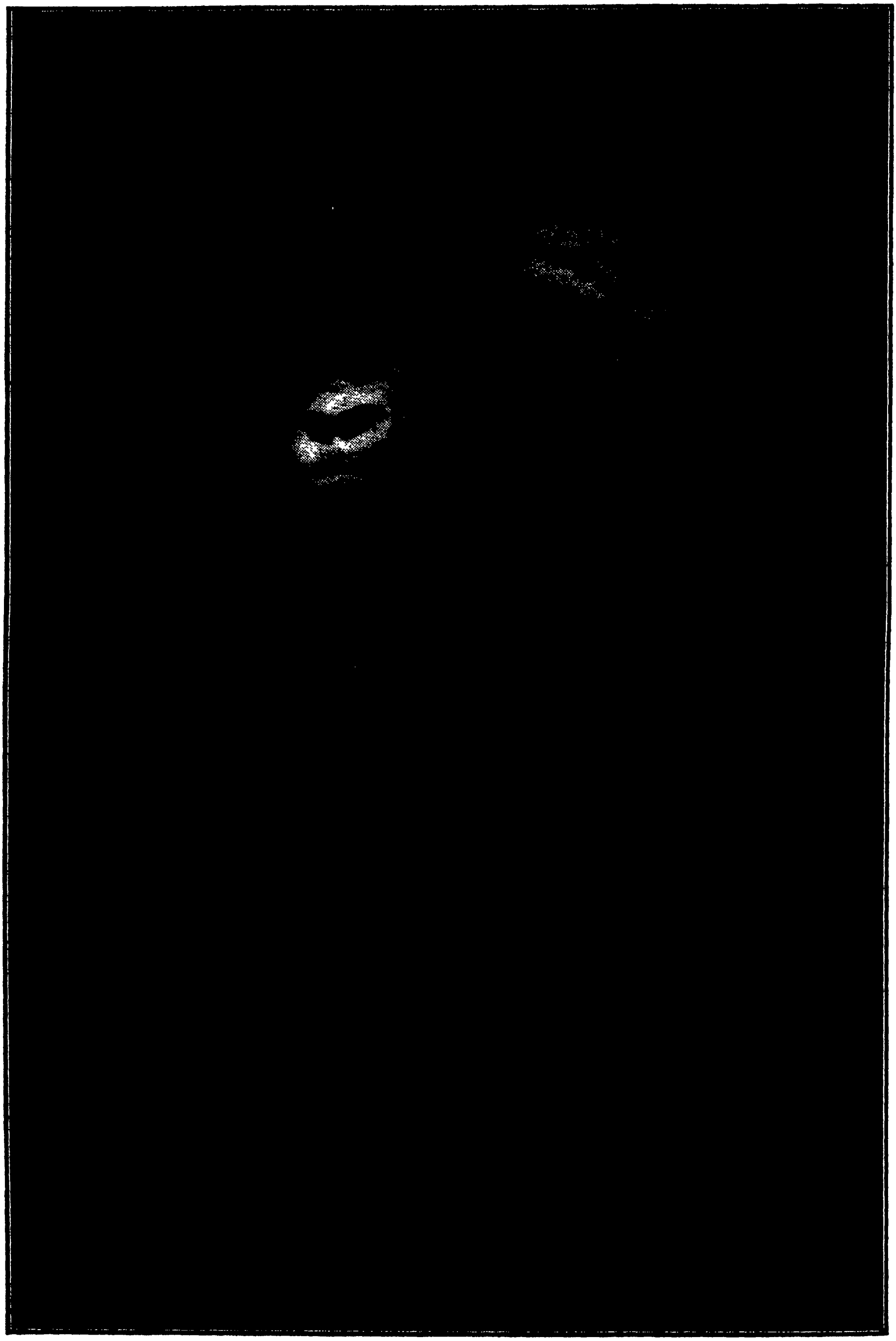
THE HOME OF THE EASTERN GORILLA: YOUNG GORILLA CLIMBING.



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THE HOME OF THE EASTERN GORILLA: FEMALE GORILLA.

FIG. 7.—VANHULST, SÃO TOMÉ.

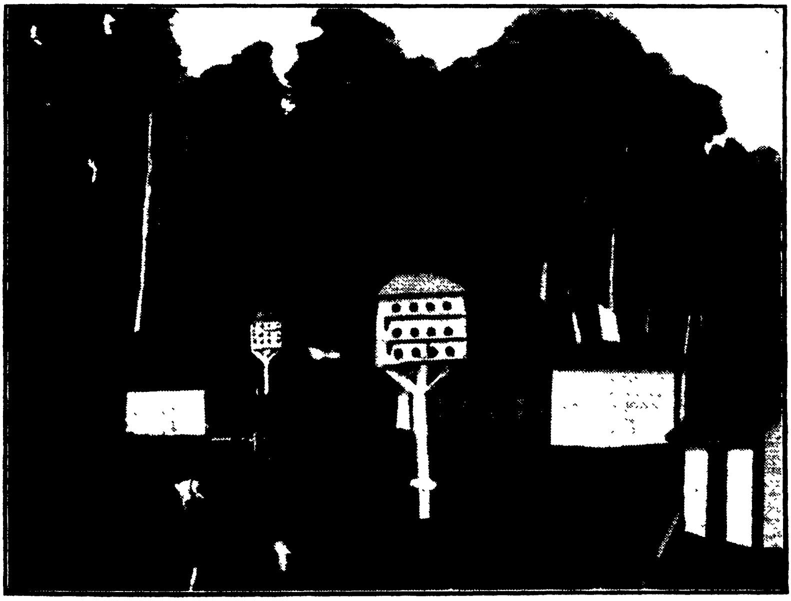

FIG. 8.—VIEW OF FOREST FROM VANHULST, SÃO TOMÉ.

was that, attractive as the prospect of a stay at such a place as the Roça Rio do Ouro appeared, the offer of Mr. Guilherme van Leeuwen to show us Vanhulst, a small coffee plantation on the edge of good original forest, was eagerly accepted, and when on October 26 we went up to Vanhulst with Senhor José Mendes Ferreira and saw the forest within five minutes' walk of the little house, we could not do other than decide at once to accept gratefully Mr. Van Leeuwen's offer (Figs. 7, 8). I am sorry that I have no photograph of the procession up to Vanhulst on that occasion, as we looked rather like Don Quixote and Sancho Panza, the one on horseback and the other on a mule. The following day we went up on foot, accompanied by carriers from Zampalma and also by our cook, Nazaré, and his wife. The two boys first selected for us turned up at Zampalma before we started, dressed for a holiday in the city, and were at once dismissed by Mr. van Leeuwen, who promised to send us up two boys from Trinidade on his way down. This he kindly did, and we had good reason to be grateful to him; for they both proved to be such good servants that we had no hesitation in taking them to Principe with us later (Fig. 9). It did not take us long to get our new home into order and to start exploring the surrounding country. The *dependencia* of Vanhulst was in charge of a native, Cabo by name, and he

FIG. 9.—OUR SERVANTS AT VANHULST, SÃO TOMÉ.

looked after the house until our two boys arrived, and he afterwards became very friendly and served us in many ways. The *serviçais* (native labourers from the mainland), of whom there were not a great number at Vanhulst, lived in a row of huts in the compound (Fig. 8), in which there was also a stable and a poultry house. They were generally to be seen during the hours of daylight (5.30 a.m. to 5.30 p.m.) at their tasks in the plantation, or making or improving roads.

We managed to live very well at Vanhulst, and our servants (Fig. 9) seemed well satisfied with their rations, which consisted of beans, rice, fuba or banana flour, dried fish, and bananas. We took up with us some tinned provisions and two dozen fowls, and we managed to get potatoes, rice, bananas, and occasionally bread from the Roça Zampalma. We were also able to get Portuguese wine at sixpence a bottle. Our cook, Nazaré, was excellent, and we never ceased to be amazed at the three courses he would produce for the two of us out of a fowl, little bigger than a bantam, and a little rice. This generally took the form of soup, a dish of pieces of chicken (including the liver, heart, etc.) mixed with rice, flavoured with a kind of tomato paste, followed by roast chicken—the legs and breast. We always thought that he killed and dismembered the chicken with a log of wood or some other heavy blunt object, otherwise he could never have produced the second dish, from which I omitted one of the ingredients when I mentioned it just now, namely, numerous splinters of bone.

Fig. 10.—View of Pico de São Tomé from Calvario, São Tomé.

We stayed at Vanhulst from October 27 until November 26, and, though I found it very disappointing from the point of view of the number of insects obtainable during the daytime, the number of moths that came to light at night was more satisfactory. Collecting in the forest, where the trees were always dripping wet, was not very productive either by day or by night, and I had no success with light other than at the house, where the whitewashed wall provided a good screen. By walking up and down the forest paths carrying the lamp I caught a few Geometridae of rarely more than one or two species. Occasionally the number of moths coming to light on the verandah was exciting enough to induce Mr. Exell to lend a hand, but there was generally on these occasions a proportion of common species of which I had to stop taking specimens.

Fig. 11.—Clouds and Mountains, São Tomé.

Of the excursions we made from Vanhulst the most exciting was our ascent of the Pico de São Tomé (6642 feet) on November 12 (Fig. 10). A day or two earlier Mr. Exell had made a trip to Calvario (5230 feet), and had discovered that Mecoto, the older of our two boys, could not face the crossing of the ridge known as the *escadas* (ladders), which connects that mountain with the Pico. The drop on each side of this ridge is so great and so absolutely sheer, that in the misty conditions, which nearly always obtain around these mountains (Fig. 11), it is difficult to judge the distance, but it seemed to us that it must be between two and three thousand feet at least. We decided to undertake the trip from Calvario by ourselves. We set out on Armistice Day, 1932, and arrived at the top of Calvario (Fig. 12) in a storm, and were compelled to put up our tent in the rain. We made ourselves comfortable for the night and sent the boys back to Vanhulst. Next morning we set out soon after 6 a.m., crossed the *escadas* and climbed the Pico, reaching the summit in pouring rain about 9.30 a.m. On the way up we found the curious conifer, *Podocarpus Mannii*, and at the top the fine tree-heath, *Philippia thomensis*. Mr. Exell gathered specimens of these two plants and a few others, and then, as there seemed nothing else to be got and we were thoroughly chilled through, being soaked to the skin by icy cold rain, we decided to return to our camp. We were surprised to find cinchonas (quinine) planted right to the summit of Calvario, and certainly above 6000 feet on the Pico de São Tomé.

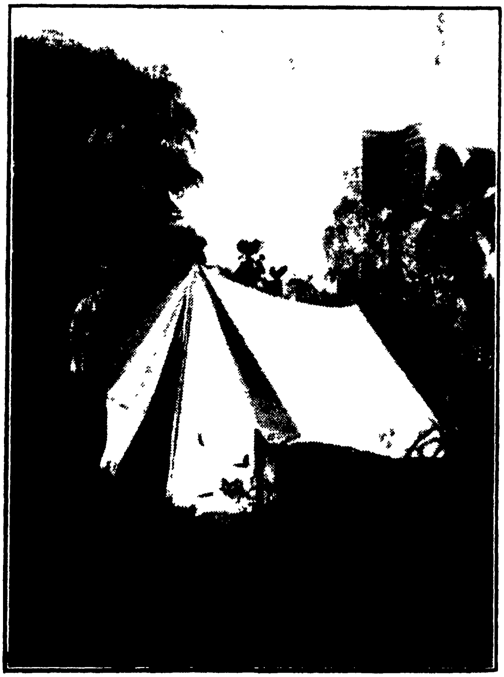

FIG. 12.—CAMP AT SUMMIT OF CALVARIO, SÃO TOMÉ.
Mr. A. W. Exell standing beside the tent.

(To be continued.)

BEHIND THE SCENES IN THE MUSEUM. IV.

By W. E. SWINTON, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

THE previous articles have been devoted to the persons and groups of persons who are responsible for the smooth working of the Museum as a Government institution, for the maintenance of the fabric and its contents, and for the efficient correlation of the work of the Scientific Departments. What of these Departments themselves?

The scientific work of the Museum, which is after all the main purpose of the institution, is done by the Scientific Staff, divided into Departments according to the nature of the things they study. There are five such Departments: those of Zoology, Entomology, Geology, Mineralogy, and Botany. They are officially quoted in that order and so we shall treat them here, beginning the description of the scientific work with the Department of Zoology.

This is not the oldest of the Museum Departments; but it is quite definitely the largest, both numerically and territorially. Its premises include the whole of the western wing of the Museum (except for the basement floor and part of a small gallery), the greater portion of the new Spirit Building on the north-western side of the Museum (Fig. 1), and the new Whale Hall * with its basement (Fig. 2). In addition, a Preparators' Shop and the old Spirit Building (Fig. 3) are under the control of the Zoological Department; they are situated on the west and north of the main buildings respectively. Thus, the premises of the Zoological Department cover more than half the area of the whole building, and more than two acres of exhibition space.

The Staff which works in these buildings deals with zoological material in workshop, store-room, study, or gallery, prepares exhibits, issues reports on collections, and answers queries, as well as performing the routine duties inseparable from any office and constantly carrying on the research made possible by the excellent material in its care. The personnel is under the direction of the Keeper, the present head of the Department being Dr. W. T. Calman, F.R.S. There are two Deputy Keepers, who assist in this directional function, and thirteen Assistant Keepers, each of whom has charge of one group or more of animals, and is responsible to the Keeper for the care of these

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* An illustrated description of the building is given in vol. iii, pp. 184–188.

collections and the exhibits, etc., relative to the particular group. There are also seven temporary or unofficial scientific workers, who give assistance with certain animal groups. In addition to these persons employed on wholly scientific duties there are a librarian, seven clerks, six technical assistants, ten attendants, and four typists, making a total Departmental Staff of fifty-one.

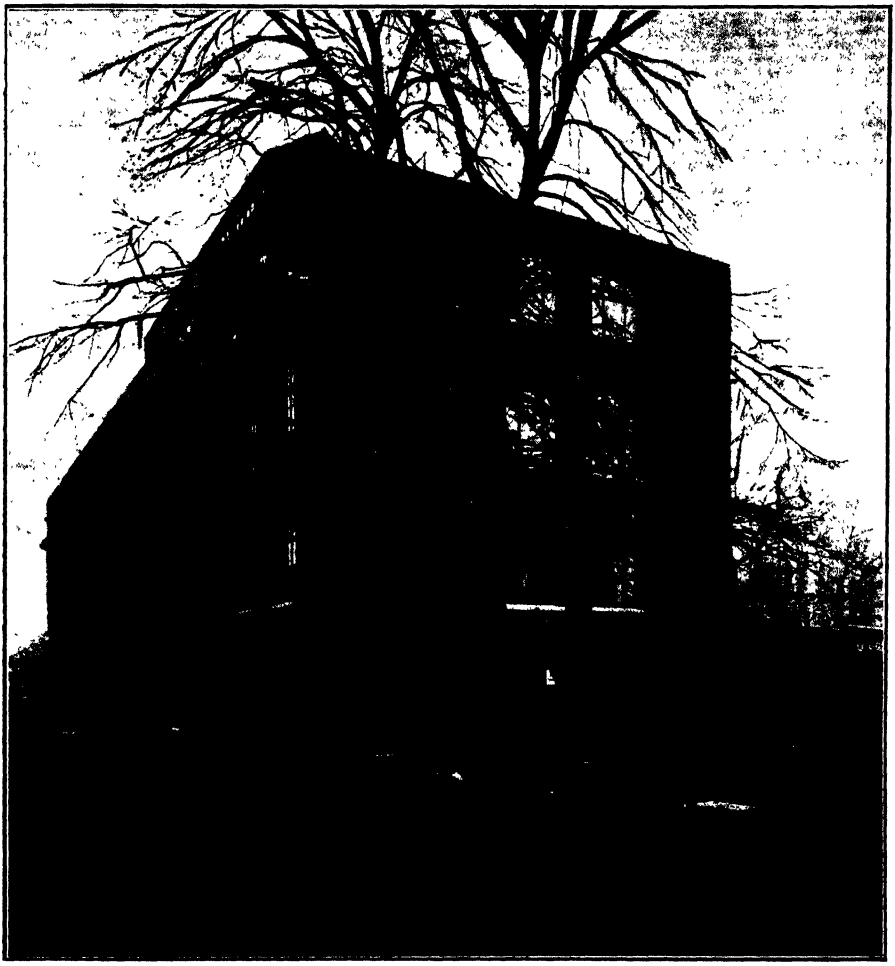

FIG. 1.—NEW SPIRIT BUILDING.
Photograph taken before the erection of the new Whale Building.

In order to appreciate the work and resources of the Department it may be best to describe the sequence of events concerned with a collection.

Collections are obtained by the Museum in a variety of ways. A ready-made collection may be presented to, or purchased by, the Trustees of the Museum for a Department, or an expedition may present some of its results in an unprepared condition, or a member of the Staff may be sent off to collect. The

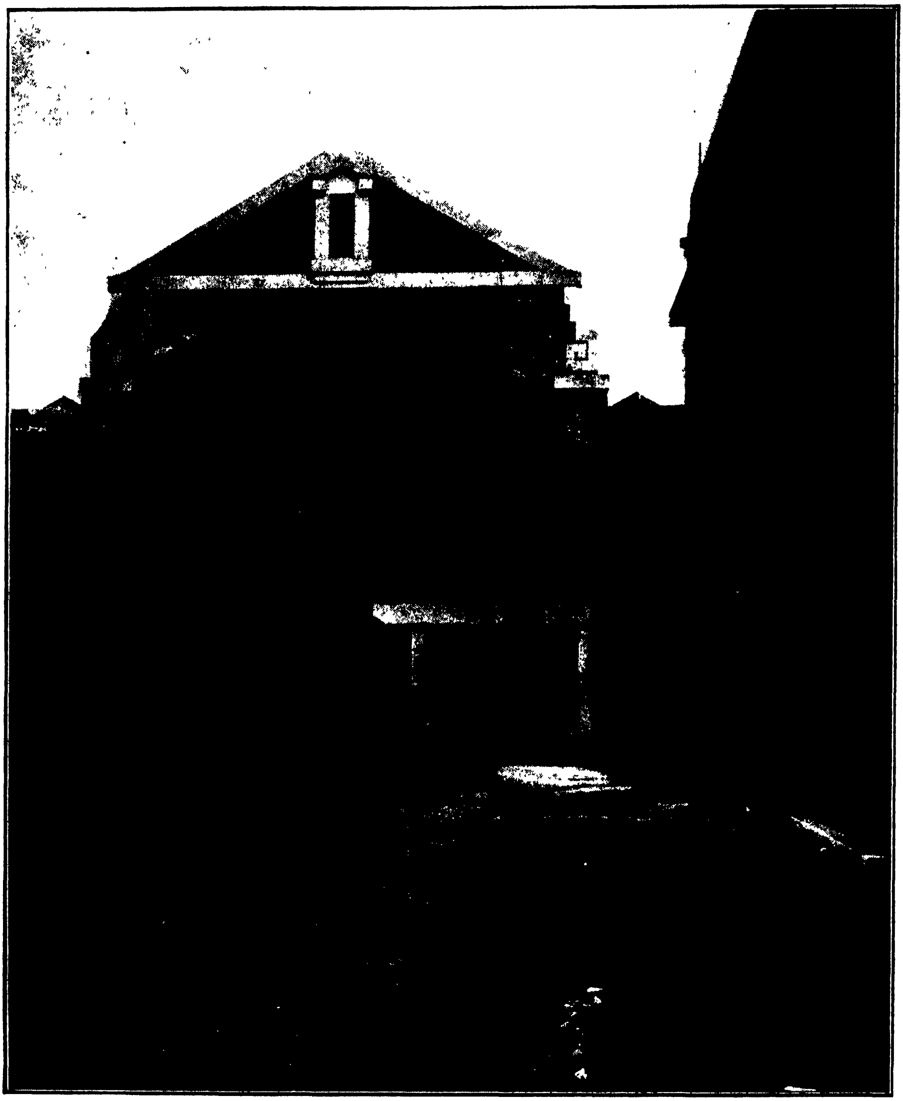

FIG. 2.—NEW WHALE BUILDING.

On left, temporary building containing Oceanographical Collections; on right, new Spirit Building. Roadway tunnels under, curving to the right.

Department has been fortunate in its friends, for many fine collections have been made available from regions, often remote, in all parts of the world. Cooperation with other Departments of the Government has also resulted in an increase of the Museum's contents, and the interest and services of many Political and Service Officers have been of great value to zoology. Specimens may be acquired through the exchange of duplicates.

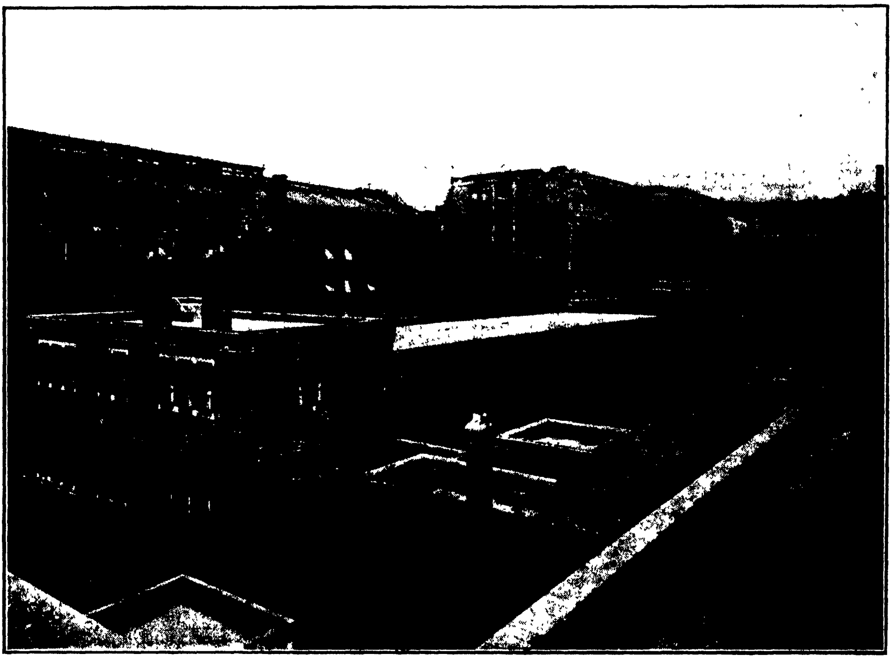

FIG. 3.—OLD SPIRIT BUILDING.
Above, from left to right, Science Museum, with corridor-bridge communicating with new Museum of Practical Geology.

Much of the organization work of these expeditions falls upon the Museum Office, as was mentioned in a previous article, but the necessary technical advice can only be given by one who is intimately aware of the special needs of special zoological groups. There are many articles too that the Museum has to lend to bona-fide collectors who will assist its work and add to its contents. Collecting apparatus, tanks, and the preserving fluids, such as alcohol or formalin, all require careful preparation and examination. The specialist aspect of such collecting journeys falls upon the members of the Zoological Department.

There is another and little known duty that falls upon that Department. If any whale is stranded upon the British coast, by an arrangement with the Board of Trade, the Coastguard or Receiver of Wrecks is required to telegraph the circumstances to the Museum. Often the matter is taken up and the whale, or a part of it, is either cast in plaster where it lies or transported to the Museum: if the Museum does not require it, it is disposed of locally. Sometimes, the Museum's part in this business involves considerable work, as in 1927 when a whole school of "False killer" whales (*Pseudorca crassidens*), numbering one hundred and twenty-five individuals, was dealt with at Bonar Bridge, in the Dornoch Firth, by members of the Zoological Staff. These whales were all dealt with on the spot and their skeletons are now undergoing examination in the Museum. In any event full particulars of all such strandings, of which something like forty occur each year, are recorded at the Museum.

In a previous article the procedure on the arrival of a general collection or a large specimen has been described. Naturally, the zoological material is at once transferred to the appropriate person. There is a special Zoological unpacking room where the needs of the particular group of animals concerned can be met, and where information is noted for use in registering the specimens later. The collection must be carefully sorted and the groups given to the Assistant Keepers in charge of them. Material in preservatives must be specially cared for and transferred to fresh vessels with the correct strength of fresh preserving fluid, for the preservatives used by the collector in the field may not be the best for museum purposes or for long-continued use. Skin specimens must be chemically treated to kill destructive insects and for preservation, and for this purpose a special room exists below the new Whale Hall. Other animals may arrive unskinned and the skin must then be removed for stuffing or for storage, while the flesh has to be got rid of so as to leave the skeleton in a suitable condition for handling. Anatomical investigation is frequently made before the flesh is removed, and the stomach contents as well as the skin are usually searched for parasitic forms of life which are also examined scientifically and may be added to the collections.

The removal of the flesh and muscles from the bones is known as maceration, and is accomplished either by boiling the specimens, as is done with smaller mammals and pieces of whales, or by burying in a sand-pit where after a time the flesh rots away and leaves the bones free. The latter process is used for larger mammalian carcases, but the Museum has facilities for both processes and they are much used.

The method of preserving the material differs : invertebrates, fishes, small reptiles, and amphibia are usually preserved in spirit or in formalin; while birds and mammals are preserved as skins, some of which may be stuffed to reproduce the living appearance, as is generally done with exhibited specimens, the skeletons being separately stored, usually in the Osteological room, for comparison, or entire specimens may be preserved in spirit.

When the specimens are thus ready for the further stages of their Museum progress, some scientific examination is made of them and they are named as accurately as possible and registered. Every Museum specimen is registered, though the actual method of registration varies slightly in the different Departments. The scientific name, the locality of origin, the name of the donor or vendor, and the date of registration are entered in a book against a number, and this number and the date are written or printed on a small label which is attached to the specimen, or to the jar containing it, or to the label on bottle, microscope slide, or other container. Card indexes are usually kept of all the specimens and their place in the exhibition gallery or the store, so that every specimen is really easily accessible. It will be realized that a rigid adherence to rules and a careful organization are necessary, when it is borne in mind that there are some three million specimens in the Zoological Department and any one of them may be wanted at a moment's notice.

After registration the specimens are variously dealt with : they may be stored or placed on exhibition forthwith, or made the subject of study, the results of which may be published by a learned society or included in the report of a Government Department.

Storage does not imply, as so many members of the public seem to think, that the material is out of sight and out of mind. In store it is more easily accessible to the student and specialist than when on exhibition. Further, exhibition value and scientific worth are by no means synonymous terms, and many animals of the greatest scientific importance would be meaningless and even dull as public exhibits. Thus a great proportion of the Museum's wealth is in the form of stored specimens. This point is worth stressing as so many visitors believe the whole function of the Museum is exhibition, and that all the Museum's contents are on show. A few instances will dispel this illusion. The store-room area of the Zoological Department is a little less than the whole of that of its exhibition galleries, but it must be remembered that storage conditions can be more crowded than can be exhibition cases. In the fish collection there are two hundred thousand specimens, while it will be obvious to any visitor that not one per cent. of this number is exhibited in the Fish Gallery. In other groups, particularly among the invertebrates, of which there are nearly two millions, the percentage of exhibited material is even smaller. In the higher vertebrate groups the ratio may be higher, but it is still relatively low.

FIG. 4.—STORE-ROOM INTERIOR, NEW SPIRIT BUILDING.

This will serve to show that an overwhelming amount of zoological material is stored. As this is very valuable, the storage conditions must be as nearly ideal as is possible. Accordingly, store-rooms are well lit, airy, conveniently built, and kept continually in excellent order. The specimens are fully catalogued, and periodic inspection ensures that overheating, evaporation of preserving media, or any other undesirable circumstances are kept in check. With skeletal specimens the storage arrangements are quite commonplace, but perhaps few persons have realized what large quantities of inflammable spirit are contained in the old and new Spirit Buildings. In the main (public) Museum building the number of spirit specimens is almost negligible, but in the Spirit Buildings by far the greater part of the space is devoted to their storage. Naturally the most stringent regulations are in force to prevent fire. The new Spirit Building, for example (Figs. 1 and 4), is a ferro-concrete structure, with metal fire-proof doors throughout, and with a widespread system of sprinkler-valve fire-prevention devices. Although the spirit used has not a high degree of volatility, the amount of irreparable damage that could be caused is not pleasant to contemplate.

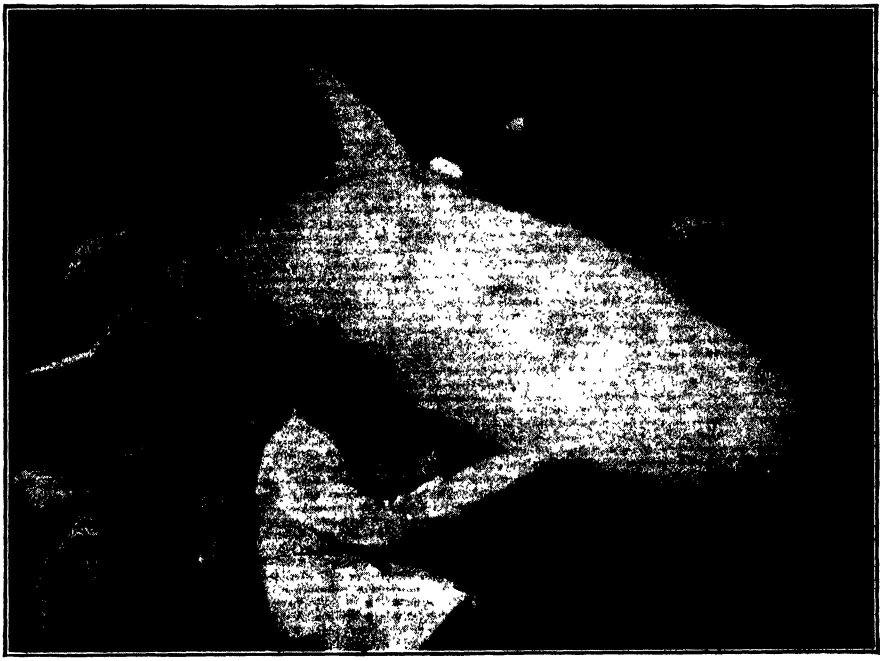

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FIG. 5.—CAST-MAKING IN THE PREPARATORS' SHOP.

Such stored material, then, is every day used for examination and comparison by the Staff, and is examined every year by large numbers of investigators. No special comment need be made here on museum study-methods, as they are, in the main, similar to those of persons in university laboratories.

The visitor may notice that in many instances the exhibits are composed not of real specimens but of plaster-casts. The reason for this is that the need for preserving the specimen makes its exhibition difficult, or that exposure to light would be harmful. Often also the animal is required for study and for the purposes of the exhibition-case a cast is just as suitable. With such things as whales, it would be obviously impossible for many reasons to exhibit the real thing. Quite apart from the great weight, the Public Health authorities would raise objections ! In all these instances casts are used, and the source of them is the Preparators' Shop (Fig. 5). The manufacture of reproductions of delicate animal organisms demands manipulative skill, artistic ability, and patience, as well as a considerable knowledge of the animals themselves, while the casting of large animals calls for no little mechanical ingenuity. The process, though apparently simple when seen, is not so easy to carry out, while to colour the finished cast so that the model is scarcely distinguishable from the original is a praiseworthy performance. In the Preparators' Shop the skins of birds are also prepared and stuffed.

But the work of the Staff cannot wholly be devoted to the duties already outlined. The number of visitors with queries to be answered, and specimens to be identified, or who seek and receive advice, is very large and seems continually to increase. In addition, there are many inquiries by post and telephone, not only from private individuals but also from commercial bodies, Public Authorities, and Government Departments. It is perhaps too little realized by the public how much they are indebted to the research work of National Museum staffs. It is true that the main part of the Zoological Department's work is systematic, but upon that sure foundation the rest of zoological work must rest to be secure. The researches of the Staff have bearings, often to no small degree, upon Medicine, Public Health, Agriculture, and many other, some of them industrial, fields. It is no over-statement to say that the realization of the grave Musk Rat menace in this country originated in the Zoological Department of the Museum.

One feature of the Department that must be mentioned is the excellent library of over fifty thousand works, which is probably the best zoological library in the world. Indispensable to the Staff and used by numerous visitors, this great store of zoological knowledge is available to all genuine students and inquirers.

The Staff is intimately connected with most of the movements of importance to animal life in this country. The Musk Rat campaign organization, committees that investigate the use of animal skins in commerce, and, on the other hand, societies for the preservation of faunas at home and abroad, all have Museum representatives.

Meanwhile, additions to the collections come in at the rate of something like fifty thousand a year. Exhibits have to be repaired and renewed, expeditions sent off, books have to be written, reports issued, and correspondence continued. Telephonic communications regarding the names of animals in cross-word puzzles are therefore not encouraged. Every year some 13,000 visits for the purpose of study are recorded for the Department of Zoology.

BOOK NOTICES.

The History of the Entomological Society of London, 1833–1933. By S. A. Neave, O.B.E., D.Sc., assisted by F. J. Griffin, A.L.A., with an Introduction by E. B. Poulton, D.Sc., F.R.S., and a Financial Chapter by A. F. Hemming, C.B.E. Pp. xlvi + 244, with 8 plates. (London: published by the Society. 1933.)

On May 3 and 4 the Royal (as it now is) Entomological Society of London celebrated the completion of one hundred years of life and attracted to the celebration a large number of delegates from kindred and allied societies at home and abroad. It is customary on occasions of this kind to compile a synopsis of the history of the particular society, and such is the reason for the present book. It has been penned mainly by the Society's Honorary Secretary, Dr. Neave; but an extremely interesting chapter, the Introduction, has been contributed by the President, Prof. Poulton, whose first paper was read before the Society in the year of the Jubilee, 1833, fifty years ago.

The study of insects in England goes back very much further than the foundation of the present Society, and it is only the unfortunate lack of continuity that has prevented the celebration, perhaps now, of a bicentenary, as the Aurelian Society was in existence as early as 1745; but it passed. There was formed in 1780 the Society of Entomologists of London, but two years saw the end of it. The Aurelian Society was revived twice and expired. The existing Society too had its crises, even so late as 1874 when it was nearly absorbed by the Linnean Society. All such societies have their troubles, principally due to lack of money, but in the Entomological Society the personal equation appears to have been unusually prominent. Thanks to the support of many generous fellows, the Society is now firmly founded and in a strong financial position. Its very activity will, however, inevitably lead in course of time to congested accommodation for books.

Members of the Museum Staff cannot but be interested in the close relations that have always obtained between the Society and the Museum. It was, indeed, founded in the official apartments of J. G. Children in the old building at Bloomsbury, and he was its first President. With hardly an exception all those who have been charged with the care of insects in the Museum became members of the Society, many of them served on the Council, and some held an office. The Society's headquarters too have always been near the National Collection of Insects, once at Bloomsbury and now at South Kensington.

The illustration of the room in the Thatched House Tavern, where the first General Meeting of the Society was held, gives perhaps a misleading impression of the lavish splendour of meetings of learned societies in those spacious days. The Dilettanti Society is the one shown in session; the Entomological Society is believed to have been more modest in its concomitants.

British Beetles, their Homes and Habits. By NORMAN H. JOY. Pp. xi + 143, with 27 plates and 21 figures in the text. (London: Frederick Warne & Co., Ltd. 1933. 5*s*.)

THIS book consists in great part of extracts from a larger work by the same author and bears evidence of having been very hastily put together. Its title is rather misleading. Its main object proves to be to supply instructions for the formation of a collection of beetles and assistance in identifying some of the species to be found in Britain. For this purpose a number of "keys" are included, giving superficial characters for the separation of the insects into groups called sub-orders, families, etc. The limits of these have to be accommodated to the unimportant differentia selected, resulting in a system of classification at variance with those to be found in scientific literature. This is likely to prove a hindrance to any who attempt to follow the author. Information as to homes and habits is only incidental and of a very fragmentary kind. The letterpress consists of only 80 pages of large print (it would consist of less if all redundant and irrelevant passages had been omitted), and it is obvious that this is utterly inadequate for dealing with both the systematic and bionomic aspects of British beetles of which we are told that 3630 kinds are known. Thus in a paragraph headed "Apion," various species of Attelabus, Apoderus and Rhynchites are mentioned, but there is no reference to the habits of these, which are amongst the most remarkable known in the British Coleoptera. The author on p. 13 unjustifiably complains of the neglect by British entomologists of the wonderful work of Fabre, but Fabre is not referred to again, and it is doubtful whether a single one of his discoveries relating to species within the scope of this book is mentioned. The four plates containing Mr. Hugh Main's beautiful photographs of living insects in various stages are excellent, but partly unintelligible for want of proper explanation. The outline figures of about 200 species of beetles will be of use to some to whom other books are inaccessible. Errors in the letterpress are too numerous to mention.

The Meaning of Animal Colour and Adornment. By Major R. W. G. HINGSTON. Pp. 411, with 40 figures in the text. (London: Edward Arnold & Co. 1933. 18*s*.)

IN this work Major Hingston develops a comprehensive theory by which he seeks to explain the diversity of colour and ornamentation among animals. The theory consists of two main parts:—(1) 'The traditional belief that in numerous groups conspicuous or striking colour and the form and arrangements of parts such as crests, beards, etc., are used for display in courtship, is incorrect. The purpose of these colours, etc., is intimidatory; they are used for challenging and scaring the rival or enemy. Their rôle is the same as that of the savage warrior's painted face, the scarlet tunic of the British Army of former times and (if the reviewer's memory serves him aright) of the tossing horsehair crest of the Homeric warrior. (2) The diversity of colour, pattern and arrangements of external parts—the striking and bizarre and the sombre and cryptic—is the resultant of a conflict between the need for protection by assimilative and homochromatic coloration, etc., and the necessity for aggressive and intimidatory display to manifest itself in conspicuous colours and patterns. The one or the other type emerges according as the need for protection is slight or dominant. A species living in desert conditions (*e.g.*) cannot afford to be conspicuous, and therefore the majority of desert-animals are "protectively" coloured (Major Hingston does not mention Professor P. Buxton's discussion of this very complex problem). The "colour-conflict" may, however, be solved by *ad hoc* adjustments in a given species, *e.g.* the lion, in which a menacing and a cryptic arrangement of the hair exist side by side and can be put into play according to circumstances.

Major Hingston's concern with the problem of "colour conflict" is quite justifiable. Five years ago the writer of this review pointed out that such a dilemma was implicit in any theory of epigamic coloration. Students of evolution and adaptation need to face the difficulty of explaining in what circumstances an animal can afford to be conspicuous.

The greater part of the book is, however, devoted to proving that colours, ornaments and habits thought to be used for courtship-display are, in fact, intimidatory. The evidence is almost exclusively drawn from vertebrates and insects, and the author is at great pains to show that the postures and antics appropriate for displaying colour-patches and the like have, in fact, been observed or recorded. He also produces some evidence that alleged epigamic and display colours cannot have the effect claimed for them, as they are entirely disregarded by the female.

To those who have had any difficulty in believing that elaborate colour-patterns and ornaments could have been produced by sexual selection (operating either as outlined by Darwin or in the way suggested by J. S. Huxley), any alternative explanation is welcome. Unfortunately, Major Hingston's theory places almost as great a strain on our credulity as the older theory. There is, indeed, much of his evidence that is very suggestive, and one general principle which he develops certainly supports his thesis (viz. that it is in birds, in which aggressive display has largely replaced actual physical conflict, that such display is most highly developed). Nevertheless, much of the evidence is anecdotal, or based on inference or sheer supposition (p. 53 : "There can be little doubt that when an ungulate watches his rival he will look . . . essentially at the joints of the legs . . . ! "). To prove that a given colour or pattern has the assumed effect would need a very exact statistical study and a far more intimate knowledge of the animal mind than Major Hingston displays. To be just, he does supply (pp. 215, 218, 219) some evidence that enemies are scared by given colours, etc.—but such evidence is not very plentiful, and again it is anecdotal. Next, the author does not consider the occurrence of colour and ornament in animals in which no question of threatening behaviour can arise (*e.g.* Mollusca and Echinoderms). Lastly, he does not argue out the very important question as to how such threatening patterns, etc., are evolved. He does not think (p. 398) that natural selection can "generate new species." "The generating force is the vital impulse in the species itself." Major Hingston is not alone in preferring the activity of a vital impulse to natural selection as the chief causative factor in evolution. There is much evidence that animals are not the static victims of their environment. Evolution has been something more than a blind sieving of mutations. But Major Hingston should at least attempt to show how his assumed aggressive and minatory impulse gets translated into terms of heritable structure. Do birds and mammals produce the appropriate structural changes by their own efforts? From the main trend of his argument (Chapters II and III) we assume he believes

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they do. Surely it is late in the day to profess a vague belief in "Lamarckian" effects without producing any evidence that they are possible.

Major Hingston writes briskly and forcibly; but some of his observations are rather childish. Does he really believe (p. 145) that in Man the brown pigment of the eye is a token of combativeness and the blue the result of the loss of that "battle-pigment"? If this were true, it would be sorry news for Herr von Papen and the "Blue-eyed Conquerors." Has Major Hingston not heard of the "Nordic" theory? It is a very great pity that no bibliography is given. Did it not occur to the author that his book (which is, after all, full of valuable data) might be needed for serious study? Lastly, why the constant reference to "*Mr.* Darwin"? If he is bent on honorifics, why does he not allude to "Dr. Darwin"? The celebrated investigator was an LL.D.!

Gulliver in the Bush. Wanderings of an Australian Entomologist. By H. J. Carter. Pp. viii + 234, with 20 illustrations on 9 plates. (Sydney: Angus and Robertson Limited, 1933. Obtainable from the Australian Book Co., London, E.C.4. 6*s.*)

The main title of this entertaining little book is not very informative; but it may be added that the author stands at least 6 ft. 2 in. in height, and is metaphorically also something of a giant amongst Australian coleopterists. The book is really a lively narrative of his many collecting expeditions to various parts of Australia, describing the scenery, the flora, incidents of the road, camp life, and so on, and from this point of view is very interesting to anyone unacquainted with Australian conditions. The entomologist will be frankly disappointed. Beyond the oft-repeated statement that so many new species of such and such a family were found here, so many there, there is little reference to insects. There are a few observations on habitats, and occasionally a brief discussion on distribution, but insects other than beetles are only referred to quite incidentally on one or two occasions. The book reads easily, is full of amusing anecdotes and grammatical errors, and is quite well produced.

The Cult of the Goldfish. By T. C. Roughley. Pp. xiii + 146, with a coloured frontispiece and numerous figures on 28 plates. (Sydney: Angus and Robertson Limited, 1933. Obtainable from the Australian Book Co., London, E.C.4. 6*s.*)

The timely appearance of Mr. Roughley's excellent book will be welcomed by all interested in the maintenance of aquaria or garden ponds. The keeping of fish in captivity provides at once a fascinating, instructive, and comparatively inexpensive hobby, and it is one which now numbers its devotees by hundreds of thousands. Of all fishes suitable for the aquarium the goldfish has ever been the most popular, and the many strange and even bizarre varieties produced by the Chinese and Japanese by selective breeding from the humble, olivaceous-hued fish found wild in eastern Asia should satisfy the most ardent aquarist. Some idea of the popularity of the species may be obtained from the fact that about 600,000 fish are exported annually from Japan, while in the United States, where the breeding of goldfish has assumed tremendous proportions within recent years, the annual production runs into about 35,000,000 fish. That this enormous production is, in part at least, correlated with a high rate of mortality among the fish in the hands of enthusiastic but inexperienced amateur aquarists cannot be denied. To keep fish alive and healthy is not a difficult matter provided certain definite principles are followed, and the beginner cannot go far wrong if he adheres to the instructions which are given in a clear and concise manner in the present work. Indispensable to all who are desirous of setting up and maintaining an indoor aquarium, or of preparing and stocking a garden pool, this book should also provide a handy work of reference for the more experienced. Nor is its usefulness restricted to goldfish, for the general principles will apply equally well to the keeping of almost every kind of temperate fish as well as most of the tropical kinds.

After describing the origin of the domesticated varieties and entering a timely protest against the all too familiar "bowl of goldfish," the author outlines the principles of a balanced aquarium, and proceeds to deal in turn with the choice and construction of such an aquarium and its stocking with suitable plants and forms of animal life. As the book is intended primarily for Australian residents, the English reader will do well to bear in mind that some of the more detailed observations may require slight modification, and that some of the aquatic plants and animals may not be obtainable in this country. The different varieties of goldfish are next described, and a chapter dealing with their food and with the correct methods of feeding follows. The detailed treatment of the life-history of daphnids and mosquito larvæ should be of value to those aquarists who breed these extensively as food for their fish. Other subjects dealt with include the spawning habits of the fish and the development of the fry, the construction and maintenance of garden pools, animal pests in ponds, and the diseases and parasites to which the fish may be subject. The serious disease known as "white spot" or ichthyophthiriasis is dealt with in detail, and the life-history of the infusorian parasite and the treatment of the infected fish fully described.

The illustrations, most of them from drawings or photographs made by the author himself, are excellent, that depicting a "celestial" viewed from the front being particularly striking. It is perhaps unfortunate that some of the figures are separated by a number of pages from the corresponding text, but this is a minor criticism. The practical hints given in abbreviated form on page 138 should prove invaluable to the beginner, and the synopsis of diseases, their symptoms and treatment, is well done. There is an adequate index.

Fishes: their Journeys and Migrations. By LOUIS ROULE. Translated from the French by CONRAD ELPHINSTONE. Pp. x + 270, with 54 figures in the text. (London: George Routledge & Sons, Ltd., 1933. 12*s.* 6*d.*)

THE migrations of fish must always have been a subject of interest as well as a puzzle to mankind. The annual ascent of the rivers by the salmon and trout and the seaward procession of the silver eels would be familiar sights to the stone-age hunter, and to primitive man a rough knowledge of the seasonal appearances of the shoals of marine fish perhaps meant all the difference between famine and plenty. To-day, with the world dependent for a large part of its food supply upon the success of the great sea fisheries, a more exact knowledge of the movements of the shoals of food-fishes has become of paramount importance, and, as the result of mobilizing the combined resources of hydrographical and biological science, an enormous body of data relative to the subject has been accumulated. Much of this information is inaccessible, except to the student, and few of the textbooks dealing with fishes devote more than a few lines to their migrations (the word "migration" does not appear in the index to the volume on fishes in the Cambridge Natural History !). Apart from Meek's "The Migrations of Fish" (1916), inevitably out-of-date to-day, no modern summary of this fascinating subject has appeared in the English language, and the present volume, which sets out to tell in popular language all that is known about the courses and the causes of migrations, should go far towards supplying this deficiency.

In an introductory chapter Professor Roule summarizes the main conclusions of present-day biology relating to migrations. He points out that, the principal migrations are nearly always concerned with breeding. He makes it clear that the comparatively localized movements of the shoals of marine fish, the short journeys undertaken by the brown trout, and even the movements of carp in a lake, are all of the same general nature as the more obvious and much more extensive migrations of the salmon or the eel. The old ideas of the vast concentrations of individuals of one species and of their almost boundless journeys through the oceans are shown to be erroneous in the light of modern knowledge, and are replaced by the conception of a number of localized or regional concentrations within each species. For example, the southerly trend of the great herring fisheries during the year is correlated with the appearance inshore of different shoals at various seasons, and not with the following of a single migrating horde as was formerly supposed. With regard to the causes of migrations, Professor Roule concludes that the compelling and guiding force is to be sought for, not in any mysterious extra sense or inherited racial memory, but in the nature of the environment itself coupled with the condition of the fish, that is to say, whether it is in a reproductive or non-reproductive phase. Thus, the salmon in the reproductive phase is urged to ascend the rivers by its ever-increasing need for water of high oxygen content, which in turn is often linked up with a low temperature. In the case of the shad the warmth of the water is held to be the all-important factor, as it is believed to be in the case of the tunny, whereas in the herring, although temperature plays its part in determining the movements of the shoals, the spawning migrations are related more to the degree of salinity of the water. This purely physico-chemical explanation of migrations appears to be fairly well established, although in some cases the evidence supplied by the author is not very convincing. It will not meet with the approval of those writers who would ascribe to fishes and other lower animals sensibility and power of reasoning akin to that of man, and who appear to be ignorant of the fact that the available experimental evidence suggests that fishes are capable of little more than the simplest of reflex actions !

After a short chapter on the brown trout, the next four chapters are devoted to the " marvellous story of the salmon." These may be recommended as providing a well-informed and interesting account of the life-history of this species, but the statement that the salmon spends its time in the sea in depths " where utter darkness reigns eternally," feeding on " swarms of red shrimps . . . [like] oxen being fattened, stuffing away in the darkness," is perhaps open to question. Chapters dealing with the migrations of the sturgeon, shad, herring, pilchard, mackerel, tunny, cod, gilt-head or dorade, mullet, bass and other fishes follow, and there is a full and well-written account of the life-history of the common eel. This fascinating story, the elucidation of which has provided one of the most interesting biological discoveries of the present century and which will always be associated with the name of the late Professor Johannes Schmidt, is here told with a wealth of picturesque detail.

Professor Roule is an official at the Natural History Museum in Paris, and, having made a special study of the migrations of fish extending over many years, is well qualified to write on the subject. The reviewer is bound to confess, however, to closing the present volume with a sense of disappointment. The primary object of a popular book on natural history, or, for that matter, on any other subject, must always be to arouse interest in the theme with which it deals, and in the main this book may be said to attain this object. Practically all the known facts concerning the migrations of fish are to be found within its pages, and the reader who has patience enough to disinter them from the wealth of picturesque descriptive matter with which they are surrounded will not go unrewarded. Professor Roule indulges in a tremendous amount of repetition, and the frequent "purple passages," as well as the references to the "ways of nature," etc., will have a tedious effect on many readers. Others are likely to be irritated by the use, mainly for chapter headings, of such anthropomorphic terms and phrases as "wedding journey," "honeymoon journey," "husband and wife," "nuptial couch" and the like. Some of these faults, however, may be due as much to the translator as to the author himself. Mr. Elphinstone has followed the original closely, but the translation is sometimes very poor and reveals a certain degree of unfamiliarity with biological terminology. The rendering of "Puis, chez elles, avec l'âge adulte, arrive l'époque de la puberté" as "When the Golden Perch reaches adulthood it becomes pubescent," and the very unfamiliar use of the word "genetic," to describe a fish which is capable of reproduction, are glaring examples.

The figures in the text are well drawn and clearly reproduced, but the use of a greater number of sketch maps would have served to clarify the descriptions in the text and at the same time to enhance the value of the book. The absence of an index is to be regretted.

The Lamarck Manuscripts at Harvard. Edited by WILLIAM MORTON WHEELER and THOMAS BARBOUR. Pp. xxxi + 202, with 4 plates. (Cambridge, Massachusetts: Harvard University Press; London: Humphrey Milford, 1933. 12*s*. 6*d*.)

THE Library of the Museum of Comparative Zoology at Harvard College contains six holographic manuscripts of Lamarck. A translation of some paragraphs of two of them together with a general account was published by Dr. Bashford Dean in 1908, and they are alluded to in Landrieu's monograph on Lamarck issued in 1909. They are now reproduced in their entirety with a bibliographical and historical introduction and an English translation. The manuscripts consist of the following works: (1) An unpublished lecture on the "system" of Gall, who seems to be regarded at present alternatively as a speculative phrenologist or as a pioneer of cerebral localization; (2) Two articles on "L'Idée et l'Imagination," which were published in 1817 in Deterville's "Nouveau Dictionnaire"; (3) A short article entitled "Aperçu analytique des connaissances humaines . . .", an outline of a more elaborate work, published in 1820; (4) "Questions zoologiques," which seem to be a series of notes which may have been used at a later date, *e.g.* in the introduction to his "Animaux sans Vertèbres," published in 1835; (5) A short draft entitled "L'Histoire Naturelle," which was evidently a preliminary sketch of part of the first edition of the "Animaux sans Vertèbres"; (6) A brief account of a botanical excursion at Ville d'Auray in 1797, with a list of the plants he observed himself.

The student of Lamarck's career and intellectual development will find this work of no little interest. The scientific value of these essays is, however, open to question; but the editors have at least made them accessible to the student and our thanks are due to them for this service. The part of their introduction which involves a comparison between the theories of Darwin and Lamarck strikes one as a blemish in an otherwise praiseworthy piece of scholarship. Leaving the solid ground of bibliography and history they sail off into Adlerian psychology and give us five pages of highly questionable doctrine derived from a paper by Crookshank. In this we are invited to believe that Darwin elaborated the theory of natural selection as an "exteriorization of his neurotic excuses" for his own ill-adjusted life, while Lamarck's more optimistic theory was the characteristic expression of the valiant soul, who was promoted on the field at Bergen-op-Zoom, and subsequently faced grinding poverty and the cares of fourteen children and four (or three, *fide* Landrieu) wives. It is, of course, impossible to criticize this thesis seriously in a short review. We can only express the belief that the evolutionary theories of Darwin and Lamarck stand in relation to their authors' neuroses, phobias, and complexes in general exactly as a wheelbarrow does to Wednesday week.

A Check List of North American Amphibans and Reptiles. By LEONHARD STEJNEGER and THOMAS BARBOUR. Pp. xiv + 185. (Cambridge, Massachusetts: Harvard University Press; London: Humphrey Milford, 1933. 18*s*. 6*d*.)

THIS, the third edition of the Check List, is essentially similar to its predecessors, but has been brought up to date by the inclusion of all the valid forms which have been reported from the United States and Lower California since 1923. In a praiseworthy attempt to achieve nomenclatorial stability the authors have refused to make changes unless absolutely compelled, but it is, perhaps, unfortunate that this conservatism has not allowed them to revert to names which were ill-advisedly changed in the previous editions or, in some instances, to accept the views of competent zoologists who have made special studies of particular groups. Nevertheless, the list is undoubtedly a very complete and useful guide to the herpetological fauna of North America, and will prove an essential reference book to all who are interested in reptiles or amphibians.

MUSEUM NEWS.

DR. F. W. Edwards spent six weeks during July and August on the Continent visiting the Museums of Helsingfors, Tallinn (Reval), Riga, Libau, Memel, Königsberg, Danzig, Stettin, Berlin, Dresden, Halle, Hamburg, and Amsterdam for the purpose of studying type specimens of Diptera, and also to collect Diptera in certain Baltic coast districts from which material was much needed.

Mr. W. H. T. Tams and Mr. A. W. Exell returned on April 1 last from their collecting expedition to the islands in the Gulf of Guinea. The islands of São Tomé, Principe, Fernando Po, and Annobon were visited, collecting being carried out on all of them.

Mr. A. H. G. Alston has recently returned from a botanical collecting expedition in Southern Albania, a district almost unknown botanically.

Mr. G. Tandy during the period May 31 to August 21 joined a group of investigators undertaking research at Dry Tortugas, Florida.

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Beginning in October 1932, special lectures or lecture-tours were given on Monday mornings by members of the scientific staff in place of tours by the Official Guide Lecturer. Most of them were delivered in the Board Room, in the absence of a lecture theatre, and were illustrated by lantern slides. The series was interrupted during the holiday months of August and September, and began again on October 2. The following is the current programme :—

October.

2. Dr. W. E. Swinton : Dragons.
9. Capt. J. G. Dollman : Convergent evolution in Mammals.
16. Miss M. R. J. Edwards : Man's debt to Animals.
23. Mr. J. Ramsbottom : Toadstools.
30. Miss E. Trewavas : Oceanic Fishes.

November.

6. Dr. Susan Finnegan : Spiders.
13. Mr. G. C. Robson : The causes of Evolution.
20. Mr. N. D. Riley : Mimicry in Butterflies.
27. Mr. M. A. C. Hinton : The Musk Rat menace.

December.

4. Miss D. Aubertin : Insects in relation to Man.
11. Mr. F. A. Bannister : Recent advances in Mineralogy : X-ray methods.
18. Mr. J. R. Norman : Sharks.
25. Christmas Day. Museum closed.

January.

1. Mr. M. Burton : Sponges and Sponge Fisheries.
8. Capt. J. G. Dollman : African Antelopes.
15. Dr. K. G. Blair : Luminous Insects.
22. Dr. Anna B. Hastings : The natural history of the English Lakes.
29. Mr. C. C. A. Monro : Parental care in Marine Worms.

With the exception of the third and the last, all the lectures will be given in the Board Room and will be illustrated by lantern slides. The time is 11.30.

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On May 4 the Trustees of the British Museum received in the New Whale Hall the delegates to the Centenary Celebration of the Royal Entomological Society of London. The Hall happened to be available, as the exhibition of the Game Animals of the Empire, which for some months had occupied it, had been removed from it, at least as regards the floor, for many of the heads still remained on the walls. For the purpose of the reception a platform had been placed in the middle of the west wall, under the gallery. The company present numbered altogether 166.

The delegates were welcomed by the Rt. Hon. the Earl of Crawford and Balcarres, K.T., on behalf of the Trustees, and the other members of the Board present were the Earl of Ilchester, O.B.E., Lieut.-Col. Sir David Prain, C.M.G., C.I.E., F.R.S., and Sir Henry A. Miers, F.R.S. The Chairman had on his right on the platform Prof. E. B. Poulton, F.R.S., President and Honorary Life President, Royal Entomological Society, and on his left Dr. E. C. Van Dyke, one of the foreign delegates. On Prof. Poulton's right was the Director, Dr. C. Tate Regan, F.R.S., and at the other end of the front row was Dr. S. A. Neave, O.B.E., Assistant Director, Imperial Institute of Entomology, and Honorary Secretary, Royal Entomological Society. In the row behind, besides the three Trustees, were Sir Guy A. K. Marshall, C.M.G., F.R.S., Director, Imperial Institute of Entomology, and Dr. W. T. Calman, F.R.S., Mr. N. D. Riley, and Dr. G. F. Herbert Smith.

Lord Crawford said that in the unavoidable absence of the Archbishop of Canterbury, Chairman of the Board of Trustees of the British Museum, he had been appointed to preside that afternoon and on their behalf to offer the delegates a hearty welcome to that great National Museum. They felt a quasi-paternal interest in the fortunes of the Society, for it was founded in J. G. Children's official apartments in the old building of the British Museum at Bloomsbury. He gave particulars of the close connexion which had always obtained between the Museum and the Society. Lord Crawford commented on the great change in the public attitude towards entomology which had occurred since his young days, and asserted that now it was the most conspicuous and most important of the many divisions of zoology. The expansion of the accommodation for the Entomological Department had been provided by the Empire Marketing Board, and they hoped that, as recommended by the Royal Commission on National Museums and Galleries, that accommodation, which was intended ultimately for the collections in spirit, would be replaced before many years by a new building on the site of the old Whale building.

Prof. Poulton in his response said that it was his pleasant duty on behalf of the Royal Entomological Society of London to offer their warmest thanks to the Trustees of the British Museum for their delightful reception and to Lord Crawford for his most friendly welcome. The help and encouragement which they had invariably received from that august institution began with their birth, and this association, which had continued, had proved of immense benefit to the Society and, he thought, of some value to the Museum. For some years a common link had been provided by the Imperial Institute of Entomology, which had one home in the Museum and another in the Society's building. Formerly, the Society was lodged at Chandos Street; but, when the natural history collections were transferred to South Kensington, the Society could not bear to be left behind and soon followed. The reception that afternoon was a most happy omen for their second centenary.

Dr. Van Dyke, who spoke for the foreign delegates, remarked that ever since his earliest boyhood the British Museum had been in his mind, and it was a great pleasure to be present on that auspicious occasion. The Museum had always been most catholic in its service; students were given full liberty with very limited restrictions, with the result that it had become the Mecca for students in all parts of the world.

Dr. Regan said that, speaking on behalf of the Museum Staff, they were glad to welcome the delegates and the Officers of the Royal Entomological Society of London. The advantage of scientific work was that apart from its own interest it enabled one to make so many friends, and the Museum had friends in all parts of the world.

At the east end of the Hall a series of entomological specimens and publications of historical interest was on view.

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THE PROTECTION OF THE FAUNA AND FLORA OF AFRICA.

By Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

At the recent International Conference for the Protection of the Fauna and Flora of Africa, held in London from October 31 to November 8, 1933, the following Committee was appointed to draw up the list of animals and plants which were in need of protection :—

Sir Arnold Hodson, K.C.M.G., *Chairman.*

Union of South Africa .	Sir Arthur Hill, K.C.M.G., F.R.S.
Belgium	Dr. Van Straelen. Dr. Jean Derscheid.
Great Britain and Northern Ireland .	Mr. W. J. Bigg. Captain Keith F. T. Caldwell. Dr. Percy R. Lowe, O.B.E. Captain R. J. D. Salmon.
Egypt	Dr. Ibrahim Kadry.
Spain	Don José Da Casa Calzada.
France	Professor Bourdelle. M. G. Petit.
Italy	Marchese Saverio Patrizi. Professor Edoardo Zavattari. Professor Isaia Baldrati.
Portugal . . .	Dr. Luis Wittnich Carisso.
Anglo-Egyptian Sudan .	Major W. R. Barker.
Joint Secretaries .	Captain Guy Dollman. Mr. D. H. F. Rickett.

The Committee was instructed to divide the list into two Classes, A and B. Animals belonging to the species mentioned in Class A were to be protected as completely as possible; the hunting, killing, or capturing of them was to take place only by special permission of the highest authority in the territory, which permission was to be given either in order to further important scientific purposes, or when essential for the administration of the territory. Animals belonging to the species mentioned in Class B, whilst not requiring such vigorous protection, were not to be hunted, killed, or captured, even by natives, except under special licence granted by the competent authorities. For this purpose a special licence was accepted as denoting one other than an ordinary game licence, to be granted at the discretion of the competent authority, and giving permission to hunt, kill, or capture one or more specimens of a specified animal or specified animals, and every licence was to be limited as regards the period and the area within which hunting, killing, or capturing should take place. The deliberations of the Committee were thorough and extensive; three meetings were held before the delegates and their advisers agreed upon the items of the Annex, which was then accepted by the Conference without criticism.

In Class A there occur seventeen entries dealing with Mammals, and three with Birds; there is also included in this Class the only plant recommended for protection, the Welwitschia (*Welwitschia Bainesii*). Among the Mammals it comes as no surprise to find the gorilla taking first place, all races, both of Western and Eastern gorillas, being included. One hears a great deal about the persecution of the Eastern gorilla, but there can be little doubt that the Western race or races are still more persecuted, especially by the natives.

At the suggestion of the French Delegation all the lemurs of Madagascar were placed in Class A, that is the family Chiromyidæ, including the aye-aye only; the family Lemuridæ, including the typical lemurs, the sportive lemurs, the gentle lemurs, the mouse lemurs, and the dwarf lemurs; and the family Indrisidæ, including the woolly lemur, the sifakas, and the endrina. It became necessary to include the three family names in the Annex, because otherwise, if the subordinal titles Chiromyoidea and Lemuroidea had been used, it might have given rise to some confusion, as there are two groups of African Lemuroidea, the pottos and galagos, which were not intended to receive protection.

Among the Carnivora we find two entries in Class A, the aard wolf (*Proteles cristatus*), and the fossa (*Fossa fossa*), another member of the fast disappearing fauna of Madagascar.

In the order Ungulata occur all the other mammalian entries in Class A. First on the list of this order comes the name of the giant sable antelope (*Hippotragus niger variani*), which was proposed by the Portuguese Delegation. Seeing that this fine antelope is only found in a very restricted area in Angola and that it has during the past fifteen years been keenly hunted, the necessary protection has not come too soon. The nyala (*Tragelaphus angasi*) and mountain nyala (*Tragelaphus buxtoni*) were also included in Class A, and what has just been written about the giant sable is even more true as regards the mountain nyala. This magnificent antelope was discovered by Mr. Ivor Buxton in the Sahatu Mountains of Arusi Gallaland in the year 1910. It was never very numerous, and as it was restricted to its mountain home, its persecution resulted in nearly all the males being shot; it remains to be seen whether the Conference has come soon enough to save this fine species.

The okapi (*Okapia johnstoni*), Barbary stag (*Cervus elaphus barbarus*), pigmy hippopotamus (*Chœropsis liberiensis*), mountain zebra (*Hippotigris zebra*), wild ass (*Asinus asinus*), white rhinoceros (*Rhinoceros simus*), Abyssinian ibex (*Capra walie*) and water chevrotain (*Hyemoschus aquaticus*) were all placed in Class A; when a species is represented by two or more sub-species, all the sub-species are included in the list, unless, as in the case of the Barbary stag, a special race is mentioned.

Another rare animal which received sympathetic treatment by the Committee was the bubal or northern hartebeest (*Bubalis buselaphus*); this antelope, being so rare that many authorities regard it as extinct, was obviously a case where the Conference should extend such help as was possible.

Finally, the elephant was dealt with under both Class A and Class B. The " A " elephants include only animals in which the tusks do not exceed 5 kilograms in weight each, and the "B" elephants are specimens in which the tusks exceed that weight.

Three birds were placed in Class A:—the whale-headed stork or shoe-bill (*Balœniceps rex*), the bald-headed ibis, or waldrapp (*Comatibis eremita*), and the white-breasted Guinea fowl (*Agelastes meleagrides*). The reason for the inclusion of the latter species in Class A seems a little obscure, but the Italian Delegation held strongly to the view that this bird should be protected and it was finally included among the " A " species.

In Class B there are thirteen entries dealing with Mammals, and nine with birds. Amongst the Mammals there are two entries under the order Primates, the chimpanzee (including all races), and all forms of colobus monkey. Thus, in the latter genus (*Colobus*) we shall have protection not only for the black and black-and-white colobus, but also all the red colobus monkeys, that is all sub-species of *Colobus badius*.

The remainder of the Mammals in Class B, with the exception of the pangolins, are all Ungulates, commencing with the much sought after giant eland or Lord Derby's eland (*Taurotragus* *derbianus*), the protection to be extended to all three sub-species; thus the western or typical race, the Congo form, and the giant eland of the Sudan are all included under this heading. There are six further entries in this class dealing with antelopes, of which, perhaps, the most deserving are the white-tailed gnu or black wildebeest (*Connochætes gnou*), and the bontebok (*Damaliscus pygargus*), both of which species have been reduced in number from the countless thousands which roamed the plains of South Africa in the early part of the nineteenth century to a few herds kept in a state of semi-domestication on certain South African farms.

The yellow-backed duiker (*Cephalophus sylvicultrix*) and Jentink's duiker (*Cephalophus jentinki*) were included as being rare species, while two further rare antelopes, the beira (*Dorcotragus megalotis*) and the dibatag, or Clarke's gazelle (*Ammodorcas clarkei*), both from Somaliland, were considered by the Committee to be worthy of positions in Class B. The beira and the dibatag are not only rare animals but are also the objects of much speculation concerning their natural affinities.

All giraffes were placed in the "B" list, as also was the black rhinoceros; this latter species, although plentiful enough in some parts of Africa (in certain districts in East Africa these animals are a pest), is rare in other parts; it was pointed out by the French Delegation that the black rhinoceros was a very rare animal in some of the French territories and it was accordingly agreed to include the species in Class B.

After the Ungulates we have a single entry, under the heading Edentata, to include all the species of pangolins, or scaly anteaters, of the genus *Manis*. The inclusion of these pangolins was necessary because the horny scales from their skins were being used in parts of Africa as a kind of native currency.

The most important of the birds in Class B are the four African sub-species of ostrich (*Struthio camelus camelus*, *S.c. australis*, *S.c. massaicus*, and *S.c. molybdophanes*, these four races being included under one number. The secretary bird (*Sagittarius serpentarius*), the marabou (*Leptoptilos crumeniferus*), and four species of egret: the little egret (*Egretta garzetta garzetta*), the African great white egret (*Casmerodius albus melanorhynchus*), the African yellow-billed egret (*Mesophoyx intermedius brachyrhynchus*), and the buff-backed heron (*Bubulcus ibis*).

With the exception of the elephant, black rhinoceros, white rhinoceros, giraffes, and some of the lemurs and colobus monkeys, all of the Mammals together with four of the Birds in the Annex are illustrated in the *Supplement*, pp. xxxiii–xl.

A VISIT TO THE ISLANDS IN THE GULF OF GUINEA.

By W. H. T. Tams, Assistant Keeper, Department of Entomology.

(Continued from p. 137.)

We returned to a deserted native shelter in a large clearing known as Estacão Souza (5230 feet), and in leaving this we must have taken the wrong path; for we soon found ourselves in strange surroundings. This was before midday, and we had brought no food from our camp. It took us till dusk to find Estacão Souza again, and it would have been too dangerous to cross the *escadas* in the dark, so we slept—intermittently—in wet clothes in a bed made of bracken laid on poles, with a cold wind blowing up over the edge of the precipice to the south of us. Up at 5.30 next morning, we set out to try again. We had to cross three huge ridges before we struck the Calvario ridge, and after we had struggled up on to the crest, we had to face the *escadas.* We safely negotiated these, and were proceeding along, happy to be on our way to our camp but very tired, when we found that our path, which was a six to ten feet wide ledge on the face of the precipitous mountain wall, was completely blocked by a fall of earth and trees. Neither of us will ever forget that last obstacle. Mr. Exell found on the *escadas* what we thought was an orchid, but it has turned out to be *Utricularia bryophila,* a bladder-wort.

The other spot in São Tomé that proved very fascinating from a botanical point of view, but not exciting entomologically, was Lagôa Amélia, once a crater lake, now a swamp across which we were able to walk (Figs. 13, 14). The high crater walls were densely clothed with vegetation, with here and there a large clump of tree-ferns (*Cyathea*) near the bottom and some magnificent begonias on the crater rim. We made three trips to this delectable spot. The first time we set out at 7.0 a.m.; at 9.30 a.m. it started to rain and we arrived back at Vanhulst soaked. The rain continued to the late afternoon. Each day for about a week after our arrival at Vanhulst the rain started about 10.30 a.m.–11.30 a.m. and kept on for two or three hours. Later it became much more irregular, starting late and sometimes keeping on till the late evening, but it seemed always fine at night. Our third visit to Lagôa Amélia turned out wet, and I caught hardly anything. That night a storm started to blow up, and continued to do so all night, breaking at 9.0 a.m. next day with terrific

FIG. 13.—LAGÔA AMÉLIA, SÃO TOMÉ.

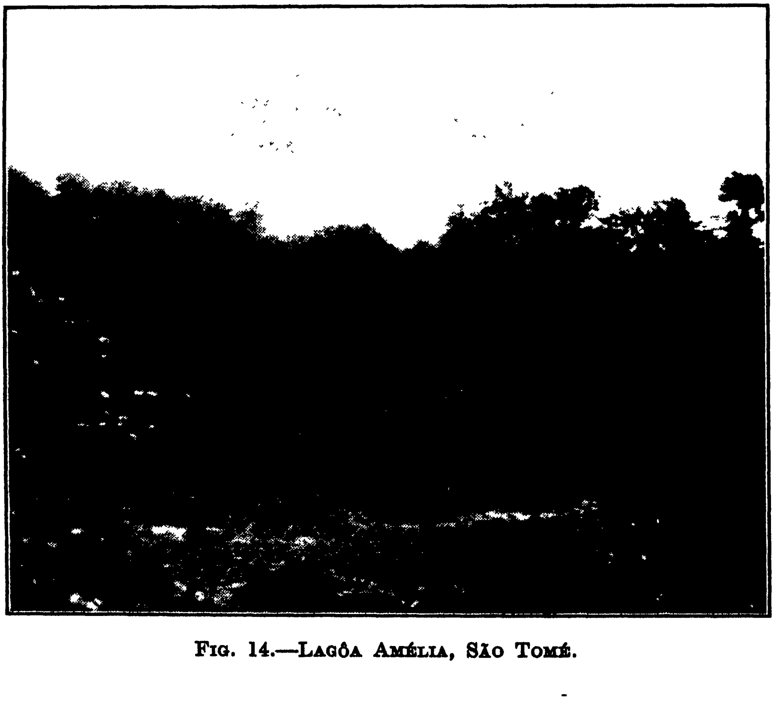

FIG. 14.—LAGÔA AMÉLIA, SÃO TOMÉ.

violence; Mr. Exell was out in it. In the evening we had a wonderful view of Principe, 90 miles away, and a friend, Senhor Saldanha, whom we visited at Roça Saudade (Fig. 15) next day, told us that in twenty-four years he had never seen a similar phenomenon. A week later we said farewell to Vanhulst (Fig. 16). By this time I had obtained a fairly good collection of moths, including a male *Streblote thomensis,* a Lasiocampid of which only the type male in the British Museum is known, a long series (over 120 specimens) of *Chionaema rufifrons* previously represented in the British Museum collection only by a drawing; and a number of interesting Pyralidae and Geometridae. On Sunday, November 27, the day on which we were due to leave Zampalma (Figs. 17, 18) for the *cidade* (city), I went to the very beautiful Roça Traz-os-Montes, where there were fine horses and cattle, and a magnificent plant for producing *aguardente* from sugar-cane. Machinery for handling coffee stood in a building alongside a stream, on the other side of which stood the building containing the sugar-cane crushing machinery, vats, still, etc. The stream turned a huge water-

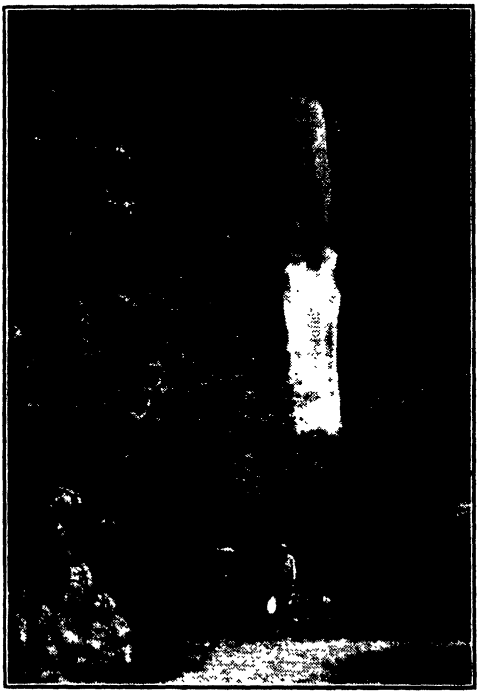

FIG. 15.—WATERFALL NEAR ROÇA SAUDADE, SÃO TOMÉ.

wheel and the power could be transmitted to either of the buildings as desired. An interesting fact connected with the name Traz-os-Montes (Behind the Mountains) is that it is taken from that of the only Portuguese province that does not touch the sea, the province whence came Fernão de Magalhães (Ferdinand Magellan), who was the first navigator to sail round the world.

After a few days at the Cabo Submarino alone—Mr. Cauvin having gone on a tour of inspection to Principe—during which we made an automobile trip through the Roça Agua Izé (Fig. 19) to the Rio Io Grande, we succeeded in getting away on the Portuguese boat " Lourenço Marques " to Principe, where we received a wonderful welcome, Mr. Cauvin having prepared the way in a manner that took one's breath away. Dr. Antonio de Mantero (Director of the Roça Porto Real), who was leaving for Europe on the boat which had brought us, took us up by the little Decauville Railway to his main Roça Esperança (Figs. 20, 21), where we discussed possibilities and the arrangements that he had in view, in order that our visit should be made as successful as possible. The result was that we were able, through the kindness of Senhor Francisco Esteves (Administrator at the Roça Sundi) and his brother Senhor Raimundo

FIG. 16.—FOREST AT VANHULST, SÃO TOMÉ.
Coffee plantation in foreground.

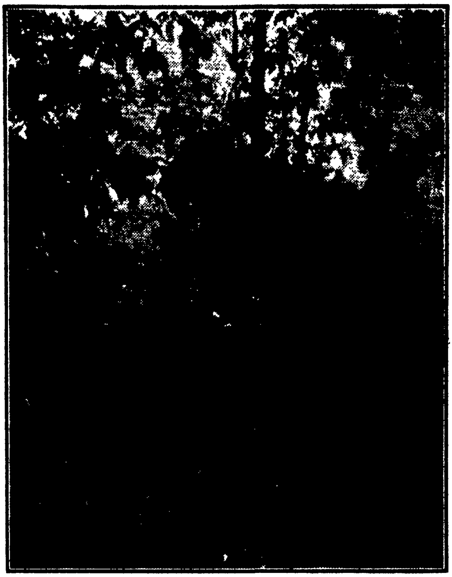

FIG. 17.—A FINE BEGONIA ABOVE ZAMPALMA, SÃO TOMÉ.

Esteves (to whom we had introductions from Prof. Carrisso), who joined forces with Dr. Mantero, to stay for twelve days at Terreiro Velho (Figs. 22, 23), and about ten days at Esperança. A very delightful and profitable stay at the Roça Infante Dom Henrique in the south of the island we owed to the generosity of Senhor J. Brito (of the Companhia da Ilha do Principe), who was temporarily in charge there.

Butterflies were more common in Principe than in São Tomé, but they were not very exciting. Moths at Infante Dom Henrique were more plentiful than at either Terreiro Velho or Esperança. Where the Decauville track came down close to the town was the only spot at which I saw butterflies congregated at mud, and the only butterfly there was a little Lycaenid, which was present in such enormous numbers that when I dropped a glass-bottomed pill-box (an inch and a quarter in diameter) over the drinking insects I imprisoned twelve. Along the same piece of track during the last few days of our stay in Principe, I found that a beautiful Papilio was attracted to mule droppings, and by dint of strenuous efforts I succeeded in getting three specimens before we had to leave.

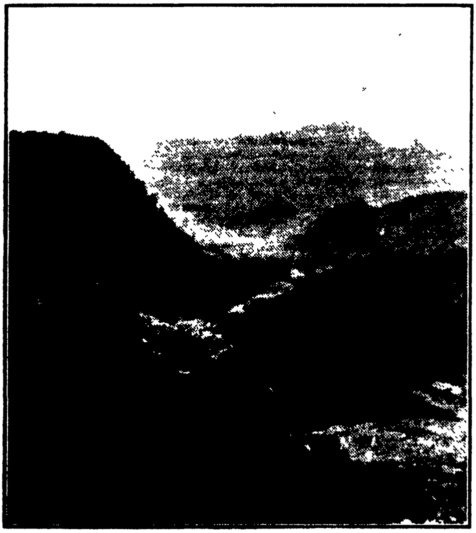

FIG. 18.—VALLEY OF THE ROÇAS NOVA CEYLÃO, TRAZ-OS-MONTES, AND ZAMPALMA (last two hidden), SÃO TOMÉ.

Our stay at Terreiro Velho was not as productive of insects as of plants. I took some butterflies, including some Acraeas, and a number

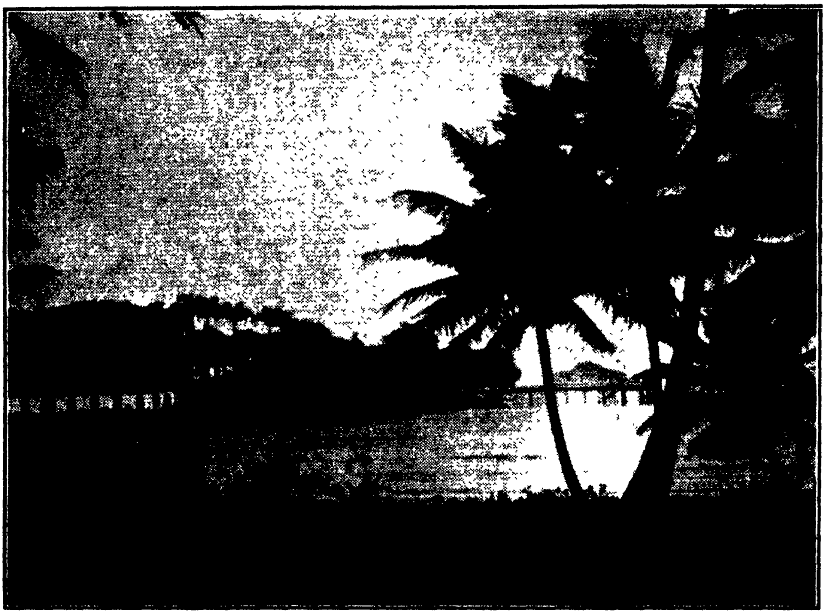

Fig. 19.—Roça Aqua Izé, São Tomé.

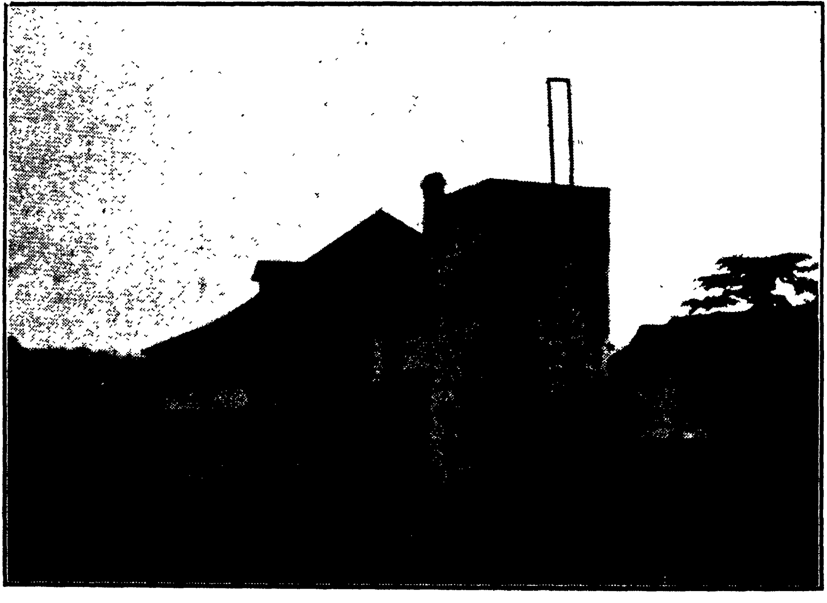

Fig. 20.—Roça Esperança, Principe.

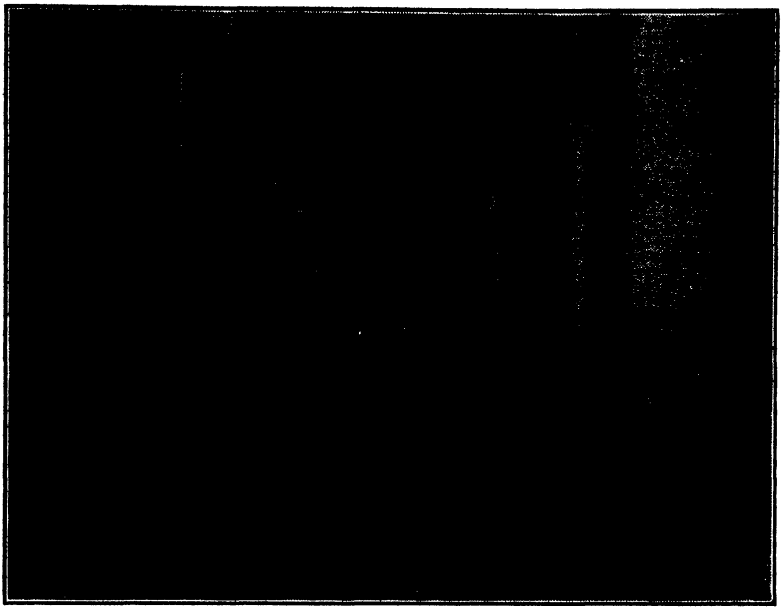

FIG. 21.—VERANDAH AT ESPERANÇA, PRINCIPE.

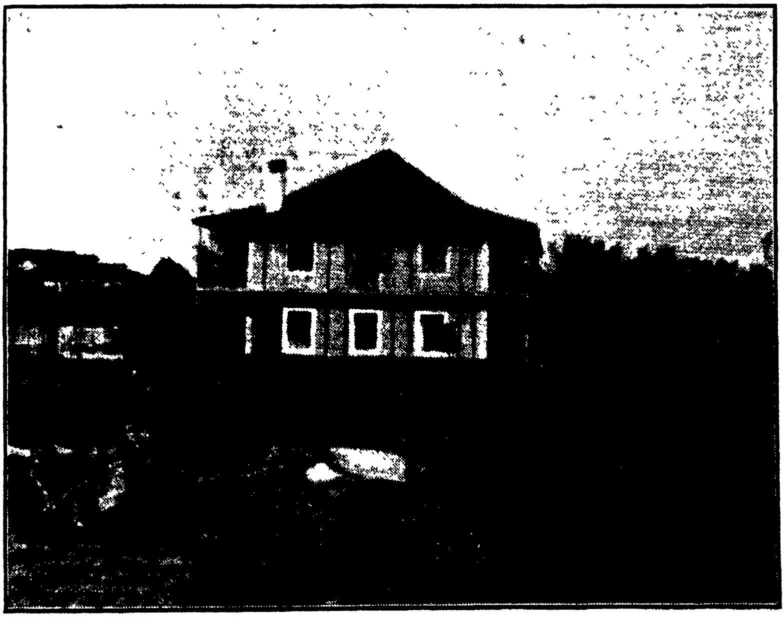

FIG. 22.—ROÇA TERREIRO VELHO, PRINCIPE.

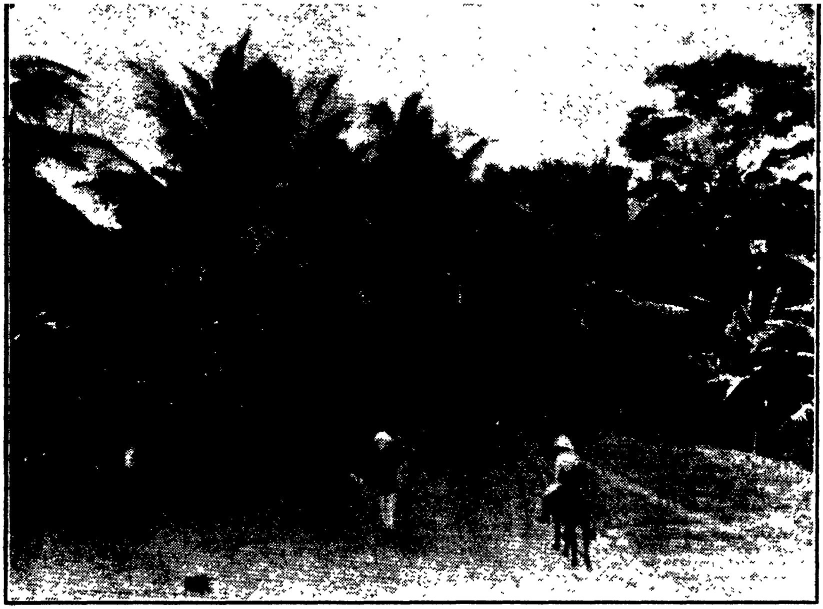

FIG. 23.—ROAD TO THE *cidade*, TERREIRO VELHO, PRINCIPE.

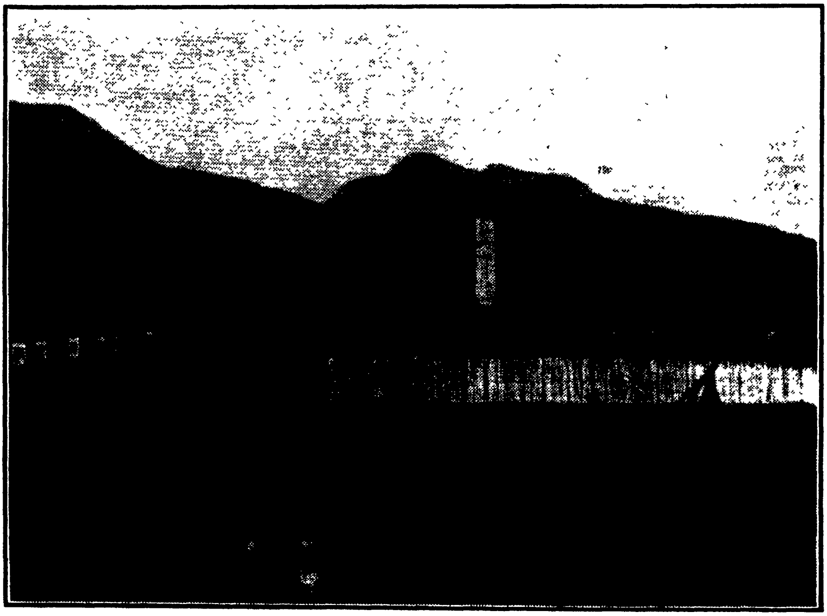

FIG. 24.—TERREIRO VELHO, PRINCIPE: VIEW TOWARDS OQUE PIPI, WITH PICO DO PRINCIPE IN THE DISTANCE.

of other butterflies and insects of other orders between Terreiro Velho and the top of a near-by hill named Oque Pipi (1100 feet) (Fig. 24). I set up a tent on Oque Pipi, where I tried working light at night, but neither there nor at the house did I have any success. Fig. 25 shows the epiphytic orchid *Cyrtorchis acuminata* (Rolfe) Schlecht., a very beautiful plant peculiar to Principe.

On December 17 Senhor Francisco Esteves and his wife gave us a delightful day at the great Roça Sundi, and drove us to three dependencies of the roça, giving us a good idea of the enormous extent of this property.

At the Roça Infante Dom Henrique (Fig. 26) we spent five days, and these proved most successful, insects being fairly plentiful and moths coming freely to light at night. This south-east corner of the island (Fig. 27) was most interesting,

Fig. 25.—Epiphytic Orchid (*Cyrtorchis acuminata*).

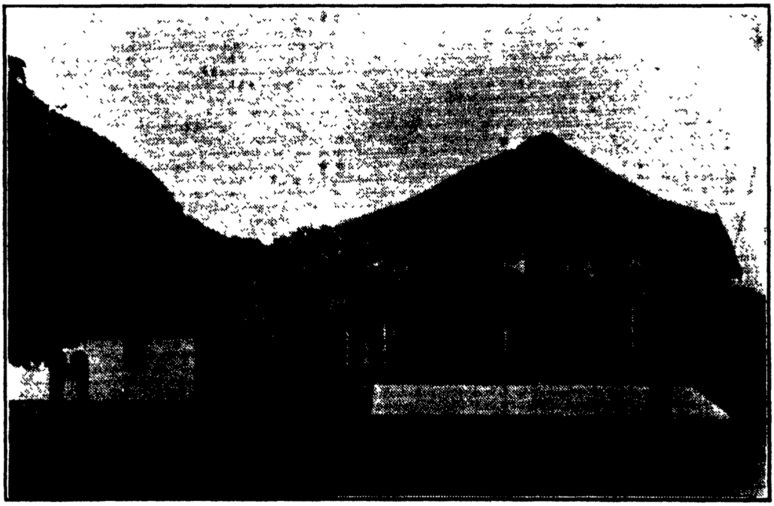

Fig. 26.—Roça Infante Dom Henrique, Principe.

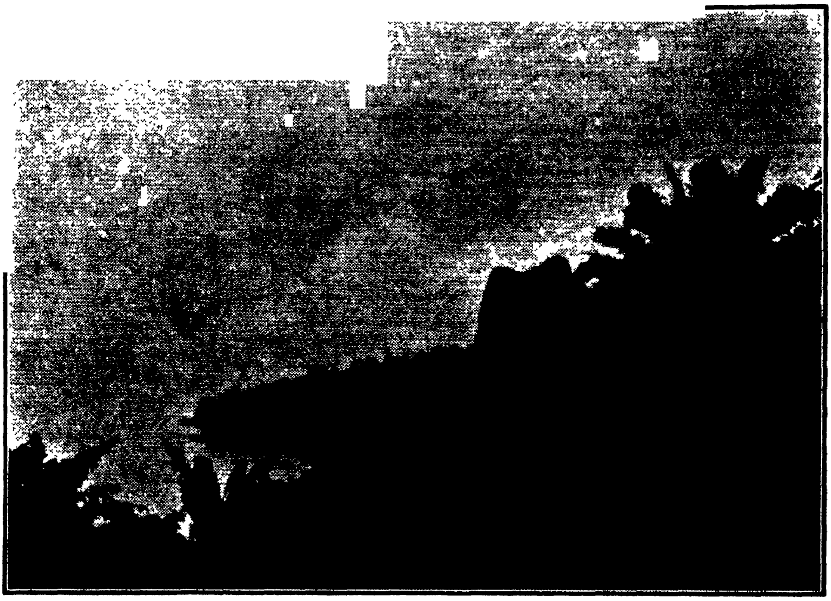

FIG. 27.—SOUTH-EAST CORNER OF PRINCIPE.

FIG. 28.—VEGETATION ON BASALT, PRINCIPE.

and I was afterwards sorry that I did not bring away some of the rock. The formation of the basalt is shown in Fig. 28; there were many exposed basaltic rocks similar in appearance to this, and some of them were complete rock-gardens in themselves, a species of *Calvoa* with magenta flowers being especially abundant.

On December 23 (Fig. 29) we reluctantly left Senhor Brito for the *cidade*, where car and mules were waiting to take us to the Roça Esperança. We owe a great debt of gratitude to Senhor Simões, the "administrador" of this Roça, for his kindness to us during the rest of our stay in Principe. He enabled us not only to carry out our excursions effectively, but also made it possible for us to accept the invitation of the Administrador-General of Principe (Tenente M. B. da Fonseca) to dinner on Christmas night, an entertainment which we shall not readily forget, for, although Tenente da Fonseca only spoke his own language, he made it very clear to us that we were not to feel any sense of loss or loneliness if he and his wife and daughter could do anything to prevent it. We are not ungrateful to him. During our ride down to the *cidade* that night we were derailed three times owing to a broken spring on the car, but, by inducing our native "conductor" to turn the car

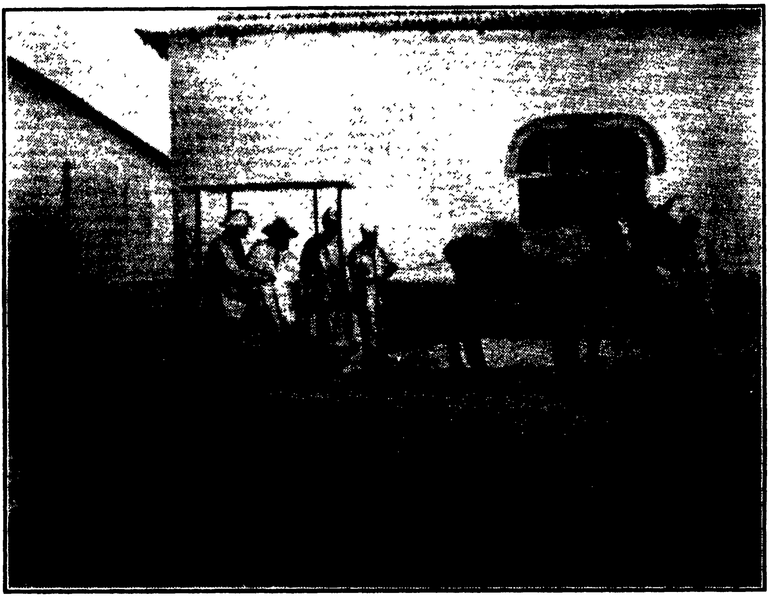

Fig. 29.—Transport in Principe.

round and run it backwards, we reached the city level safely (Fig. 30). The ride back, drawn by two fast mules, was quite as exciting with a native standing by the driver holding out a stable lamp to illuminate the track.

The fact that there was no Englishman on Principe made no difference to us; for the two Africans in charge of the Cable Station, Mr. J. Forster Cole and his assistant Mr. F. E. Wright, spoke English and Portuguese so perfectly that they were able to do us many a good turn, and we were always sure of a warm welcome from them whenever we went to the town. We recall their kindness with pleasure and gratitude.

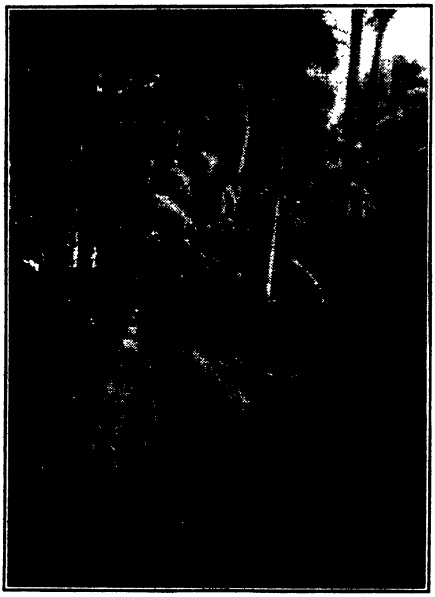

Fig. 30.—Decauville track through Plantations to Esperança, Principe.

Fig. 31.—Morro Papagaio, Principe.

On Thursday, December 29, we planned a trip to the top of Morro Papagaio (Fig. 31), and we asked Senhor Simões if we might have some sandwiches and bananas. He insisted on sending our *almoço* up after us, and I think it should be placed on record that not long after we arrived at the summit (about 2200 feet), carriers arrived bearing a hot five-course luncheon, which they proceeded to lay out properly, complete in every detail, and it says something for the climate that fried eggs arrived quite hot on the top of the peak.

Our departure from Principe was almost headlong. We had a preliminary warning of the possible arrival of a boat about January 2, 1933; so we cancelled a proposed excursion for that day and packed instead, and thereby escaped being caught in a tornado on Pico Mesa, as well as missing the boat. On Tuesday no boat or news of one having appeared, Mr. Exell went down to the *cidade* to pack plants for dispatch to Europe, while I climbed Papagaio to get some rock specimens. At 3 p.m. I was 1000 feet above Esperança, and from my high view-point could see the city and the harbour, without any sign of the expected ship. Having gathered the pieces of rock I wanted, I returned to Esperança, to find Mr. Exell back from the city with the news that the boat was expected at 6 p.m., and that we were to go down at once to the *cidade*, where Messrs. Forster Cole and Wright were expecting us to join them at the Cable Station for dinner. Fortunately our packing was practically complete, and we had only to lock up and have our baggage loaded on the two Decauville cars, say farewell, mount our passenger car, and off we went on our exciting half-hour journey to the city under our own weight. While we were at dinner the Administrador-General, Tenente Fonseca, came in to offer us the use of his *gazolina*, a kind act of which we gratefully took advantage, although our friends at the Cabo Submarino had arranged to row us out in their own

FIG. 32.—TYPICAL SCENERY IN SÃO TOMÉ.

boat. The next morning, January 5, we were back in São Tomé, where we remained till January 11, when we reluctantly said good-bye to Mr. Cauvin and the truly beautiful island (Fig. 32) where we had spent so many happy hours in his company.

We left on the steamship "Muansa," bound for Libreville, in the hope of getting a boat on to Fernando Po. The Governor of the French Congo had kindly accorded us permission to land at Libreville, but we did not avail ourselves of this courtesy, as we found lying at anchor there the Chargeurs Réunis boat "Amérique," and we were successful in transferring direct from one ship to the other. The French boat took us to Suelaba at the mouth of the Cameroon River, where we again transhipped, this time to a queer river-boat, the "Fullah," which took us up the Cameroon River to Duala. The river banks exhibit miles of a uniform growth of mangroves. The lower deck of the "Fullah" was crowded with natives bound for Duala and Haussa merchants selling trinkets. Here we were stranded for nearly a fortnight, unable to do any work because we were compelled to remain in the town in order to find some means of getting across to Fernando Po. We would both have liked a trip to Yaunde by rail and a trip by launch to Tiko in the British Mandated Cameroons, but having to send radiograms and wait for the replies, and being compelled to keep an eye on all incoming boats, made a two days' absence impossible, and when we finally got news of a boat through the kindness of the Acting Governor-General of Spanish Guinea, our time was filled up with making arrangements to get away. We made one trip by car, when we were finally ready, to the Japoma, on the Dibamba or Lungasi River, which was the scene of much activity during the Great War. Two days' delay, and then at last we set off in a *chaloupe*, or launch, the "Conscolsa," for Fernando Po. We arrived at Santa Isabel (Fig. 33) at 5 a.m. on January 26, and were met by the Governor-General's interpreter, Señor Perez, and two Spanish medical entomologists, Dr. F. Bonet Marco and Dr. Juan Gil Collado. Our two new entomological friends carried us off at once to their hotel. As soon as they knew what we wanted they found out the possibilities, and we decided to leave early next morning by launch for Concepcion in an attempt to get up to Moka. We found that a Spanish boat, the motor-vessel "Plus Ultra" (Fig. 33), was to leave Santa Isabel on February 8 for Annobon, and this left us time, if we caught the launch "Emma" early on the morning of January 27, to put in five or six days at Moka.

We had therefore an exceedingly busy day when we arrived at Santa Isabel, having to divide our baggage at the Custom House into two lots, and then to go to the Passport Office and report to the Police, and to the Mision Especial de Endemias for a *pasaporte medico* which necessitated a blood test for sleeping sickness. Dr. A. Lloret, who examined us, came down to Concepcion with us the next day, as also did one of the medical entomologists. In addition, we had to go to the Bank of British West Africa for our letters and some Spanish money, and here we made the acquaintance of the manager, Mr. C. W. Chew, the British Vice-Consul, to whom we were afterwards indebted for much kindness and help. Next morning we went down to catch the launch and were astonished to find porters busy putting on the boat the baggage we did not want, and nobody seemed to know where the other was. Ultimately we found that our packages were already in the small hold of the launch and off we went. We had with us an escort, a West Coast native policeman (Fig. 43) kindly provided by the Governor-General. He spoke English, French, and Spanish, and proved an excellent servant. The run to Concepcion occupied about eight hours, and we had an opportunity of seeing the nature of the beautiful east coast of the island, dotted with *finkas*, which are the Spanish equivalents of the *roças* of the

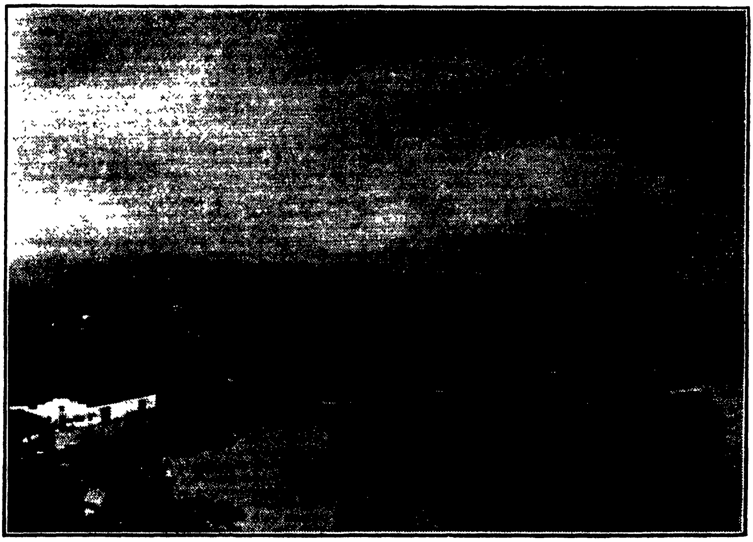

Fig. 33.—Santa Isabel, Fernando Po.
Motor-vessel " Plus Ultra " in harbour.

Portuguese islands. They have a striking feature not possessed by the *roças* in São Tomé and Principe, in the chimney of the drying-house, which is a tall cylindrical structure. On our arrival at Concepcion, where one is carried ashore by natives from surf-boats (Fig. 46), Dr. Lloret, in order that we should lose none of the short time available to us, commandeered the Chevrolet motor truck which General Luis Valdes (Fig. 45) had sent down for various consignments he expected from Santa Isabel, had us and our effects loaded thereon and sent us off with a letter of introduction to the General. About two miles from his house (Riasaka, 2000 feet up, Fig. 45) we found General Valdes waiting for his Chevrolet, and he was rather taken aback at this somewhat unprecedented invasion. However, he speedily recovered, and we were very soon at the house, where he made us very welcome and very comfortable. In the morning we were sent off early, after an excellent breakfast, to Moka, 2000 feet higher, where we found Señor Juan Bonelli Rubio, a naval engineer, and his charming wife, who took care of us until the appearance of Señor Joaquin Vidaror, of the Compania Colonial Africana (Fig. 34) to whom we had an introduction.

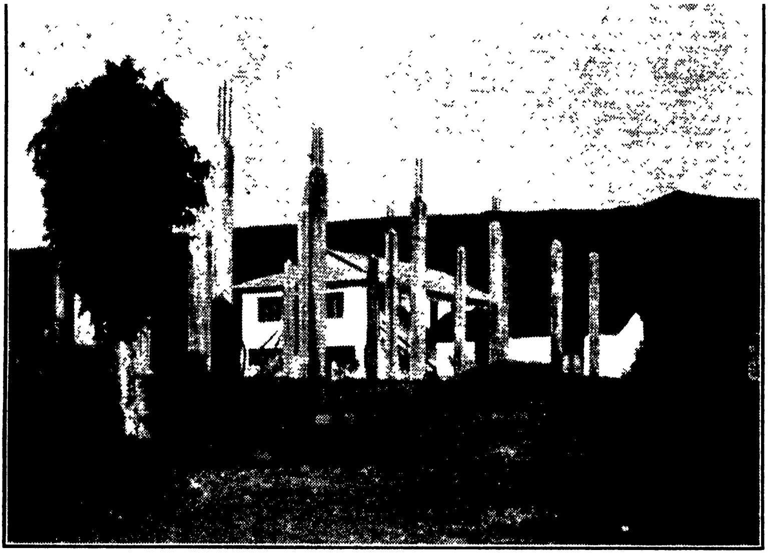

FIG. 34.—COMPANIA COLONIAL AFRICANA, MOKA, FERNANDO PO.

(*To be continued.*)

BEHIND THE SCENES IN THE MUSEUM. V.

By W. E. SWINTON, Ph.D., F.R.S.E., Assistant Keeper, Department of Geology.

THE second of the scientific Departments is that of Entomology, and it follows naturally enough upon the Zoological Department both in point of numbers and in history, although territorially it is not so extensive. The premises of this important Department include the greater part of the Basement floor of the west wing and the newly-erected western end of the New Spirit Building. Actually, although an area of some 35,000 square feet is thus set aside for entomological purposes, it is not sufficient for the rapidly increasing collections and the number of research workers, so that plans are now being made for a very necessary increase of accommodation.

In no Department is the disparity between the specimens exhibited to the public and the collections in store or study so great; for, despite the really enormous amount of material in the Department, the whole exhibited series is confined to part of one small gallery on the Ground floor of the west wing.

This does not mean that this great and private host of insects is unsuited for public inspection or devoid of interest. It means that, having arranged a perfectly adequate introductory series for the public, the Departmental Staff is wholly engaged on study and research, for which continual reference to its great collections is necessary. It is important to make this clear, for there are many who consider that specimens not on exhibition cannot be of interest, that they must be duplicates and as such should be distributed to less wealthy and humbler institutions.

The Entomological Department does make numerous exchanges with, and gifts to, many other institutions of recognized standing at home and abroad, and would gladly make more. But it should be realized that it is scientific necessity and natural profusion, not professional jealousy or excessive acquisitive zeal, that make the Insect Collection so large. To use a homely simile, because most of us prefer to wear only one suit of clothes at a time, must the remainder of our wardrobe be considered duplicate, unnecessary, and rightly to be given away?

The actual number of specimens in the Department cannot at the moment be stated precisely. The last census was in 1931, on the occasion of the Museum's Jubilee, when a detailed analysis of the collection was published.* In May of that year the total number of insects in the Museum was 7,834,933, of which about five million were in the arranged collection and the remainder was still undergoing examination. It may be of interest to state that of the total nearly one-half consisted of Coleoptera or beetles, and that, huge as the whole figure is, the Museum has only representatives of little more than half the known species. Since the date on which these figures were compiled there have, of course, been considerable additions, so that at the present time the total collection is estimated at something just over 8,500,000. The yearly total of these additions, by gift, exchange, and purchase, averages about 300,000.

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* *Entomologist*, 1931, vol. 64, p. 242.

Words should be unnecessary to emphasize the magnitude of the Department's task. To bring up to date the identification, arrangement, and indexing of the specimens always awaiting attention, with fresh consignments continually arriving, is a work that might well be called a labour of Hercules. The mere mechanical handling of the insects is a full-time occupation in itself, but when comparison, study, and scientific description are added, to say nothing of routine correspondence and attendance on visitors, the need for a considerable and qualified staff and well-equipped laboratories becomes evident to even the most prejudiced. Unfortunately, owing to the economic crisis the Treasury have hitherto been unable to allow the increase in the scientific staff that had been previously promised. The personnel of the Department numbers forty-three, and is under the control of the Keeper, Mr. N. D. Riley. There are two Deputy Keepers, and the scientific staff otherwise consists of nine Assistant Keepers and five unofficial workers on the scientific side. The technical staff numbers eight, while there are eight attendants, and a temporary staff of nine whose duties lie mainly in the direction of typing, indexing, labelling, and general preparatory work.

Entomology is, of course, the science of insects, and the Department is the only one in the Museum confined to such strict systematic limits; for as insects are animals it may be asked why the Zoological and Entomological Departments are under separate control. Until 1913 they were not so, and the Insect Collection formed merely a part of the zoological series. However, the rapid expansion which accompanied recognition of the fundamental importance of entomological work in connexion with many urgent economic problems led ultimately to the separation. of the Departments, primarily on account of the difficulties of administration.

The economic importance of insects has long been realized and the War brought to it, as to many other things, much greater recognition. But the Department, though it makes great contributions to economic problems, is essentially interested in systematic work, in the comparison of various forms, in the exact determination of genera and species, and in the description of specimens new to science. Without this carefully constructed groundwork no economic work would be secure and the whole fabric of zoological science would be nothing but a pretence.

The range of insects is great both in size and variety, in form and colour. Those who keep pleasant memories of sunny days are under a great debt to these forms of life. What sort of summer would it seem without the chirping of the grasshopper, the buzz of bees, or the erratic flight of the butterfly on the summer wind? The pollination of the flowers and the honey on the table are things to be thankful for and are the results of insect life. On the other hand, the sting of the wasp, the ravages of the clothes moth, and the unpleasant activities of the bed-bug are insect maladies to be deplored. Abroad and in warmer lands insects again may cause two extremes; for the amazing beauty of some tropical form winging its way through the sunlit glades is in wide contrast to the delirious and fevered victim of a mosquito bite.

All these multifarious agents for good or ill are the care of the Entomological Staff, to whom on nearly every day of every year specimens from all parts of the world arrive. The identification of these and the preparation of reports upon them take up a very considerable amount of time, and in this connexion it is important to mention the excellent cooperation which exists between the Department and very many institutions all over the world for the exchange and description of material.

The Imperial Institute of Entomology, an independent body set up expressly to assist Colonial governments, is concerned with economic entomology. It has its headquarters in the Entomological Department, and the close association is one of much mutual benefit. The highly important work of the Institute depends greatly on the identifications made by the Museum Departmental Staff, while to the Museum the Institute presents a considerable number of specimens. In 1932 the number of specimens thus transferred was over 16,000, of which nearly 400 were types of new species.

It is easy to write that a department's work is of great importance, but it may be hard to show that it is so. The Entomological Department has, however, an unusual testimony to its worth in the shape of the recent addition to the New Spirit

Building. This was built entirely through funds provided by the Empire Marketing Board, in order to further the systematic study of insects, which they recognized to be the Department's prime function and, moreover, of fundamental importance to the many workers in all parts of the world, whose chief concern is the study of entomology in relation to agriculture, medicine, etc. While there is thus a very large amount of work always coming to the Department by post, there are also numerous personal interviews and telephonic communications, and nearly 5000 persons come into the Departmental offices as students or other inquirers during the year.

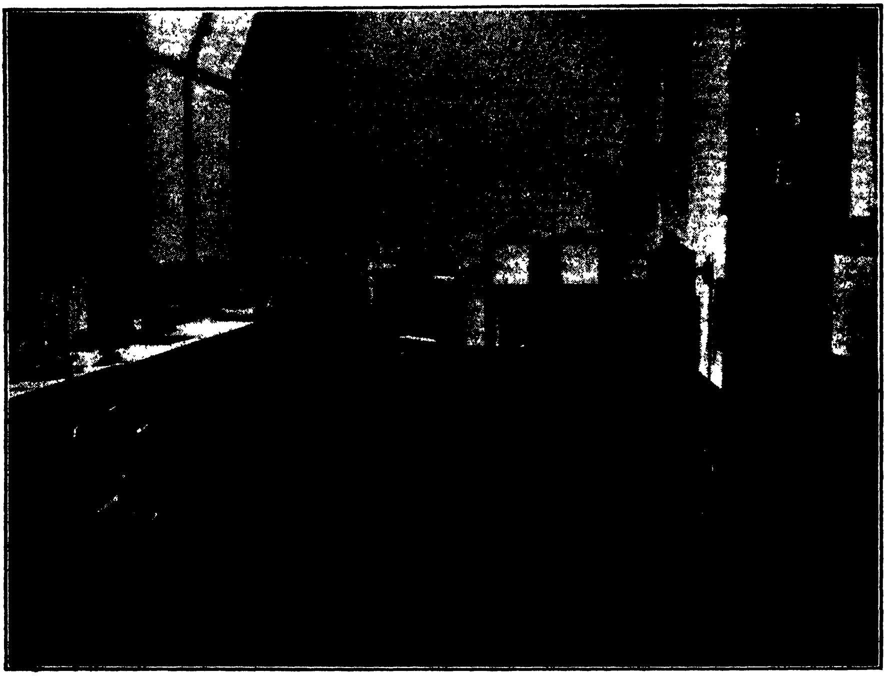

FIG. 1.—ONE OF THE STUDIES IN THE NEW SPIRIT BUILDING.

Each member of the Staff has his allotted task and insect group, and to him are referred the particular specimens, letters, or visitors requiring attention. The routine office work is thus considerable, but in addition each must constantly be bringing his part of the collection up to date, examining, identifying, preserving, storing, placing on exhibition, or describing the material which comes to the Museum collections.

Much of this work is done in one of the larger rooms, where also students are accommodated (Fig. 2), but the member of the

Staff does his detailed work in his own study (Fig. 1). The method of examining and identifying the specimens varies according to the particular Order to which they belong. Some kinds are large and can be examined and identified accurately by the naked eye; others require dissection and examination under a microscope. Whatever method is used, it will be obvious that access to a very large named series and a good library is essential.

When a collection of specimens comes to the Museum, its arrival is noted and the particulars recorded, and it is unpacked so far as is possible without doing damage to the insects. The boxes are sent to the Setting Room to await attention (Fig. 3). In fact, the Setting Room comprises four largish rooms and accommodates six persons, who are exclusively employed on this highly important, if somewhat monotonous task. The duty of this Staff is to prepare and mount the butterflies, moths, beetles and other insects, so that they can be permanently stored in a manner which permits of ready examination.

FIG. 2.—STORE- AND WORK-ROOM IN THE NEW SPIRIT BUILDING.
The brackets on the pillars are intended to carry the mezzanine floor required when ultimately the building is used for collections in spirit.

First of all, the insect is "relaxed" by placing it, in its original paper container (which bears the full history of the specimen), in a zinc box the interior of which is kept moist by means of a piece of damp flannel. After twenty-four hours in this situation the specimen is removed and, if susceptible to such treatment, fitted to a setting-board. This is really two strips of wood, mounted on a third, with a space between them. The insect is pinned through the thorax and then its body is placed in the space and is adjusted so that when its wings are spread out laterally they lie naturally upon the lateral strips of wood. The wings are extended and pressed between the strips of wood and superimposed pieces of tracing paper held in position by pins. The connexions between the wing and the body are sometimes cut to some extent to facilitate setting and to obviate "springing" of the wings after the specimen is removed from the setting-board. When the specimens have been left in this condition for about a fortnight they are removed from the boards and pinned into oblong, flat store-boxes, lined with white paper and floored with cork or peat, there to await examination by the specialist concerned prior to incorporation in the cabinets which house the

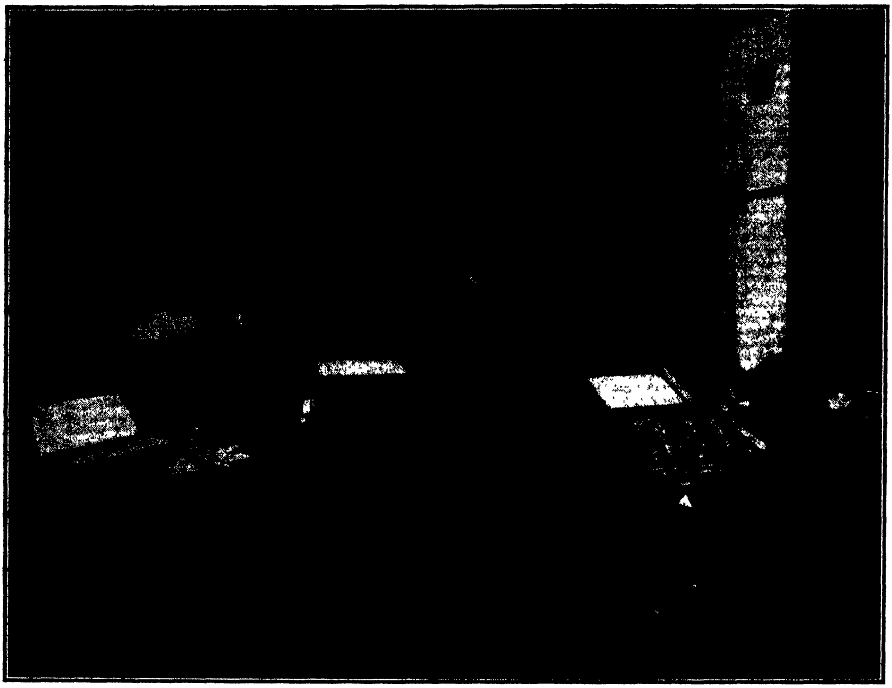

Fig. 3.—One of the Insect Setting Rooms.

permanent general collection of the Department. Every specimen can always by fully examined by lifting it out with a pair of tweezers grasping the pin head. Many kinds of insects, such as beetles, bugs, or grasshoppers are not set, but only pinned. Very small specimens cannot be pinned at all and are generally stuck on to pieces of card. Others, again, cannot be dealt with until mounted for microscopical examination.

Immediately the specimens have been mounted, and before they are sorted, each is provided with neatly printed little labels giving its whole history. This printing work is also done in the Setting Room on a small hand-press. The average number of insects dealt with annually by each person in the Setting Rooms is almost exactly 10,000. The work calls for much skill and patience, and this annual average reflects high competence on the part of the Staff; but it is easy to see that at its present staffing it cannot hope to deal with the annual additions to the collections. Increase of staff, no less than increase of accommodation, is urgently required. The boxes containing specimens are kept either in the room of the appropriate scientific expert

FIG. 4.—STORE-ROOM CONTAINING THE OBERTHÜR COLLECTION OF LEPIDOPTERA.

or are stored. One of the stores (Fig. 4), is a long corridor literally packed with such boxes and containing in all about a million specimens. Most of these are butterflies, and hence this particular store is popularly known to the Works Staff as "Butterfly Alley." Great as is the number of mounted specimens, each is readily accessible owing to the excellent systems of card-indexing.

For the scientific study of these dead specimens the microscope, the dissecting dish, and the scientific treatise are not the only things employed. In the New Spirit Building extension there are thoroughly up-to-date appliances such as electric ovens, electric refrigerators, cameras for microphotography, etc. Work is also carried on with the living forms and an experimental laboratory with all modern requirements, such as thermostatic controls, has been built and equipped on the roof of the building (Fig. 5). Here can be studied many phases of the life of insects, particularly those of economic importance. This work is of great value, and, quite apart from the strong connexion between the Museum and the Imperial Institute of Entomology already

FIG. 5.—INSECTORIES, ON THE ROOF OF THE NEW SPIRIT BUILDING.

referred to, many manufacturing concerns, local authorities, and other museums and research institutions look to the Museum for help and guidance in times of entomological trouble.

One field of this sort of work may be specially mentioned, namely, the locust problem. Plagues of locusts are known not only from biblical records, but also from serious and not uncommon occurrences in many parts of the world to-day. For many years research of some sort or another has been done on the problem, but one of the most important centres of modern work is the Museum. It may be news to many visitors that in a room in the West tower there are many living locusts kept for breeding and research purposes (Fig. 6). So important is this part of the Museum's work regarded abroad that no fewer than forty-eight countries send bulletins of information to, or apply for information from, the Museum authority, through the Locust Committee of the Economic Advisory Council.

FIG. 6.—LOCUST BREEDING IN WEST TOWER.
The glass containers in which the locusts are bred stand on the table (right); they are electrically heated.

All this research work could not, of course, be accomplished without the help of a good reference library, and the number of purely entomological works available for reference in the Department is close on 40,000, for the organization and care of which the present Zoological Library is still largely responsible.

Members of the Department do not, however, rely merely upon information and specimens submitted to them by others; for, from time to time, expeditions are arranged and led by members themselves. Within recent years excellent results have been obtained from expeditions to the South American Andes, the Carpathians, and the islands of the Gulf of Guinea, while Departmental collecting parties have made several fruitful trips to the Scottish Highlands.

For the public numerous guides and advisory pamphlets are published on the treatment of a wide range of pests: for the scientist the number of specialist papers written by the Staff is impressive.

Enough has been said to show that an entomological department is no mere society of " bug-hunters," but a highly organized centre of research of world-wide importance. The Panama Canal was made possible, Buenos Aires was able to be built, and great tracts of land throughout the world have been rendered habitable through the work of entomologists, and in all such work this Department of the British Museum has played its part and gained a reputation that is world-wide.

TWO RARE SOUTH AMERICAN MONKEYS.

By Guy Dollman, B.A., Assistant Keeper, Department of Zoology.

The Museum has recently received as a donation from the Rowland Ward Trustees two mounted specimens of rare South American monkeys, a white-collared titi (*Callicebus torquatus*) (Fig. 1) and a black-headed uakari (*Cacajao melanocephalus*) (Fig. 2), both of which have been mounted in the Rowland Ward Studios. They will make interesting additions to the Exhibition Galleries.

The titi monkeys, of the genus *Callicebus*, would really appear to represent at least three genera: one to include *Callicebus torquatus*, which is entirely different in markings, pattern and texture of coat from the other members of the genus; one to include the *Callicebus gigot* group; and the third to embrace *Callicebus cupreus* and its allies. There would appear to be some support for such a classification to be found in the skulls of the titi monkeys and it may be necessary at some future time to divide the genus into the three generic groups here indicated. At the moment, however, the available cranial material of the *torquatus* group is not sufficient to justify such a division.

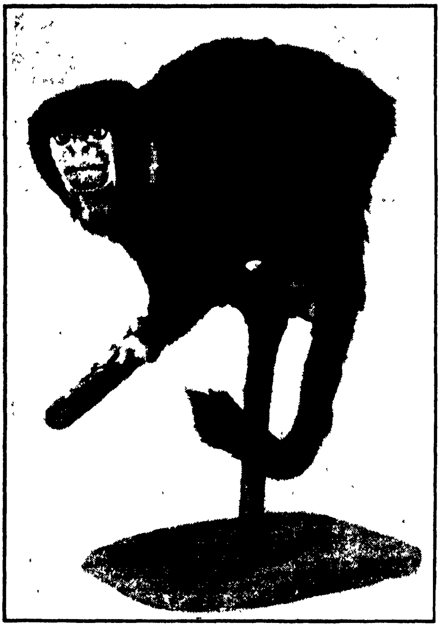

FIG. 1.—WHITE-COLLARED TITI.

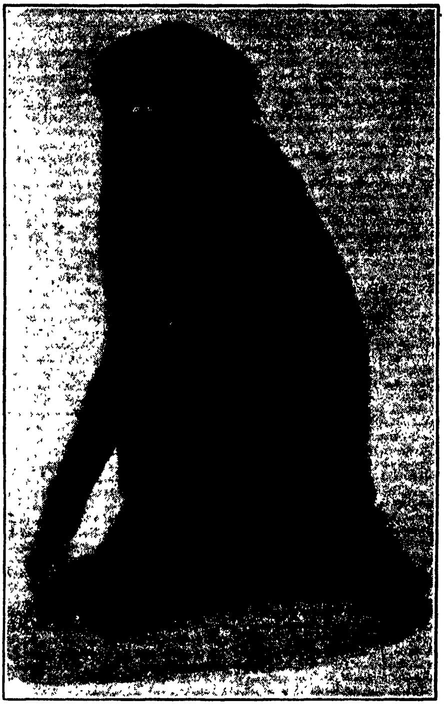

FIG. 2.—BLACK-HEADED UAKARI.

The addition of a mounted black-headed uakari to the exhibition series is one of some importance, since the Museum received from the same donors some little time ago mounted specimens of the two other species of this rare genus, that is, the red uakari (*Cacajao rubicundus*) and the bald uakari (*Cacajao calvus*), so that now all three species are represented by up-to-date specimens.

BOOK NOTICES.

The British Fur Trade Year Book, 1933. Pp. xxiv + 472. (London : Hutchinson & Co. 10*s*. 6*d*.)

One of the most valuable features of this present volume is a list of names of the different furs given in seven languages, entitled " A Dictionary of Furs." In addition to the English and scientific, or Latin, name, we find the titles, given in French, German, Russian, Spanish, and Italian, of 159 different furs.

The volume commences with a short history of the British Fur Trade by Mr. F. Rexford Poland, based on the work of his father, the late Mr. Ernest Poland. Then follows a diary of events concerning the fur trade, where entry is made of all the more important fur sales and auctions, together with such religious holidays on which no business may be conducted.

The second section deals with Government regulations affecting the fur trade and the third section with the Constitution and Composition of the British Fur Trade, in which some useful information is given on silver fox farming, and the personnel of the London Fur Exchange and the London Fur Trade Association is given in detail. Diagrams of the various trade-marks are reproduced as an appendix to the dictionary; these are sometimes zoological in design, but on the whole the fur-bearing animals are but poorly represented in these designs.

Section V deals with the fur trade of the Empire, with special reference to Canada, by the Hon. G. Howard Ferguson, High Commissioner for Canada, followed by sections dealing with the scientific educational side of the fur trade, a directory of the principal furriers, and an appendix of exports and imports.

This volume will be of considerable use not only to those intimately connected with the fur trade, but also to the scientific worker. Guy Dollman.

Functional Affinities of Man, Monkeys and Apes. By S. Zuckerman. Pp. xviii + 203, with 24 figures on 12 plates. (London : Kegan Paul, Trench, Trübner & Co., Ltd. 1933. 10*s*. 6*d*.)

This work follows closely on the heels of " The Social Life of Monkeys and Apes," by the same author, and is quite as interesting and full of information as the earlier volume. After a foreword there are two chapters dealing with the classification of the Primates; generally speaking, the classification adopted is that of Pocock and Schwarz, but the Colobidæ of Pocock have been degraded to sub-family rank, although the name is still written Colobidæ instead of Colobinæ. This does not add to the natural arrangement of the Order and in the reviewer's opinion is a mistake. The knotty problem concerning *Callimico* is left strictly alone, and the author seems undecided whether to use *Pithecus* or *Presbytis* for the Langurs. The genus *Miopithecus* appears again owing to the occurrence of a sexual skin in the Talapoin monkey, which is not found in the Guenons; this seems a very justifiable reason for again using the term *Miopithecus*.

It is difficult to agree with the suggestion that *Pithecus cruciger* is a hybrid between *Pithecus rubicundus* and *Pithecus chrysomelas*; there would seem to be no reason for such an idea, as these three species are as distinct and different from one another as any species could be.

The chapter dealing with the ages of apes and monkeys is very interesting; one learns with astonishment that the following maximum records are known :—mandrill 46 years; baboon 45 years; macaque 29 years; chimpanzee 26 years; orang 26 years; lemur 26 years; capuchin 25 years; guenon 24 years; and gibbon 24 years. Then follow some remarks on the periods of gestation of apes and monkeys; one learns that the period is 150 days in the Hapalidæ, 150 to 180 days in macaques and baboons and as much as 275 days in the orang, that is, nearly equal to the period in man (280 days).

Chapters on Blood Reaction and general behaviour follow; in the latter the difference in the method of drinking employed by lemurs and monkeys is described, also the difference in facial expression and their methods of grooming themselves. Differences in nursing are gone into in some detail, and towards the end of the book there is a chapter dealing with "Disease and Parasites of the Primates." It is, perhaps, astonishing to read that monkeys and apes in captivity rarely suffer from vermin. The Kivu gorilla, it is stated, shares with man the privilege of acting as host to a very obnoxious louse, while malarial-like parasites have been found in both New and Old World monkeys.

The volume concludes with an extensive bibliography, which will be of considerable use to the student and worker on this fascinating subject.

GUY DOLLMAN.

"*All the Other Children, a book of Young Creatures.*" By C. FOX SMITH. Pp. x + 101, with 51 plates. (London: Methuen & Co., Ltd. 1933. 7*s*. 6*d*.)

THIS little volume will appeal to grown-ups as well as to children; especially to those artistically inclined. The illustrations are of the best and the text, although light, is correct as regards most of the details and is written in an entertaining manner.

The photographs of the young fox and baby tapir are excellent illustrations, and the one entitled "Creepy-crawly," depicting an alligator and its young, might cause even a grown-up to indulge in a bad dream. There are a large number of other photographs that hold the attention and excite admiration; among these may be mentioned the following:—"The Badger," "The Ostrich," "The Swan," "The Dormouse," "The Tortoise," "The Bloodhound," "The Elephant," "The Perch," "The Zebra," "The Raccoon," "The Lemur," "The Hippopotamus," "The Hedgehog," "The Owl," "The Giraffe," and "The Snake." All these are fine studies of young animal life and should be of very considerable service to the student of art and zoology.

It is a little surprising to find in a book of such excellence an illustration (facing p. 48) of a Mangabey monkey nursing a small monkey entitled "Mangabey and Meercat"; the term "Meercat" in English should be reserved for those mungoose-like carnivores of the genera *Cynictis* and *Suricata*.

This book is to be recommended to all those interested in the childhood of animals, whether they are zoologists, artists, or the man-in-the-street and his children.

GUY DOLLMAN.

The Whipsnade Animal Book for Children and Others. By HELEN M. SIDEBOTHAM. Pp. 205, with 52 illustrations by JOHN R. SKEAPING. (London: Victor Gollancz, Ltd. 1933. 6*s*.)

THIS volume will be useful to the young visitor to Whipsnade, as it gives a general account of the grounds and chapters on the elephants, bird sanctuaries, aviaries, bears, deer, kangaroos, cattle and the native inhabitants of the Park. There is much that is helpful to children in the text, and it can be said to be instructive. More care as regards some of the details would, however, have added to the value of this work; it comes as a shock, for instance, to read that the American Black Bear is "believed to be merely a variety of the Old World brown bear," when in fact, the two species are so distinct that they are now considered to belong to different genera. Further, it would be interesting to learn from the author where her information comes from regarding the race of pigmy elephants "not much bigger than ponies." The smallest elephant at present known, with any certainty, is the West African forest-elephant (*Elephas africanus cyclotis*), an animal which, it is true, is smaller than the great bush-elephant of Africa, but would, nevertheless, be rather an out-size where ponies are concerned.

The illustrations, although not outstanding, will doubtless serve their purpose; they are outline sketches which should tempt the young artist to use the Christmas box of paints. GUY DOLLMAN.

The Dissection of the Rabbit. By R. H. WHITEHOUSE and A. J. GROVE. Pp. viii + 195, with frontispiece plate and 78 figures. (London: University Tutorial Press. 1933. 3*s.*)

THIS small volume is published as a companion to "The Dissection of the Frog," and in spite of the number of textbooks available on the anatomy of the rabbit, there would seem to be room for this carefully planned and well-illustrated work.

The photographic illustrations of the viscera and muscular systems are excellent and it seems a pity that the method has not been employed more extensively. A good photograph of a dissection of the nervous system would have been most stimulating to the novice, when trying his or her hand at this difficult task. At the same time, the wealth of diagrams will undoubtedly be of the greatest help to the student. The advantage which such outline sketches have over the old-fashioned complicated figures is very evident; in the old textbooks it took quite a long time to trace the very thin line from the figure of the dissection to the lettering at the side, and then one had to look up the letter in the text of the figure and find out what it referred to.

This book may be recommended to all who are faced with the probable dissection of the rabbit as a question in a practical examination in zoology.

GUY DOLLMAN.

The Geology of British Somaliland. By W. A. MACFADYEN. Part I of the Geology and Palæontology of British Somaliland. Pp. 87, with 15 figures on 4 plates and 1 map in pocket of cover. (Published by the Government of the Somaliland Protectorate, 1933. London: Crown Agents for the Colonies. 12*s.* 6*d.*)

THE geology of British Somaliland might appear to have received its full share of attention during the past few years, since a previous official report on the subject by Mr. R. A. Farquharson, Government Geologist, appeared in 1924, and two monographs on the geology and fossils of the Protectorate, based on collections made by Anglo-Persian Oil Company geologists, were published in 1925 and 1929 by the Hunterian Museum, Glasgow University; the geology of the north-eastern frontier region, moreover, was described by Mr. C. Barrington Brown in 1931. Nevertheless, the report now under review contains a large amount of new information as well as incorporating the work of previous authors. It is uniform with the two official reports on Zanzibar geology and palæontology published in 1927 and 1928.

The author, Dr. W. A. Macfadyen, was in charge of an expedition sent out by the Somaliland Petroleum Company, Ltd., from 1928 to 1930, when about three-quarters of the Protectorate (itself one-seventh larger again than England and Wales) was mapped geologically and large collections of fossils and rocks were obtained. The Eocene is the most widespread formation, covering most of the eastern half of the territory, but Archæan rocks, Nubian Sandstone, and late Tertiary volcanic rocks are well developed in the western half; the Jurassic is less widespread, but rich in fossils. The detailed strata sections, measured at a number of localities, are a special feature of this report and will enable an exact record to be made of the horizons of the fossils collected when these come to be described. There is an appendix on water-supplies, but no reference to mineral resources. The coloured geological map, on the scale of 1 : 1,000,000, is very clear.

It must create a precedent for the results of a commercially organized expedition to appear as a Government report, and commendation is due on the one hand to the Company concerned for permitting this use to be made of the information obtained, and to the Colonial Office on the other hand for arranging for publication. It is understood that further volumes, dealing with the palæontology, will follow. L. R. Cox.

Jacko, the Broadcasting Kookaburra, his Life and Adventures. By Brooke Nicholls, decorated by Dorothy Wall. Pp. x + 106, with 66 illustrations in the text. (Sydney: Angus and Robertson Limited, 1933. Obtainable from the Australian Book Co., London, E.C.4. 4*s*. 6*d*.)

The author of this light and trifling book is well known in Australia as the naturalist of the Melbourne Broadcasting station. In it he gives a humorous account of the kookaburra bird, or laughing jackass, as we should call it, which he found as a fledgeling in a nest in a dead gum tree in the Gippsland mountains and later on introduced to the microphone. The bird's laughter appears to be familiar to listeners in to the Australian station, and it is for them that this book is intended. G. F. Herbert Smith.

The Brooks of Morning. Nature and Reflective Essays. By Donald Macdonald. Selected by his daughter, with a foreword by Edward S. Cunningham. Pp. xii + 245, with 1 plate. (Sydney: Angus and Robertson Limited, 1933. Obtainable from the Australian Book Co., London, E.C.4. 6*s*.)

The title of this little book is taken from that of the first of the forty-four articles which the filial devotion of Mrs. Whittle has brought together in memory of her father, Donald Macdonald, who served as a journalist on the staff of *Argus* for so long a time as fifty-one years, and was, indeed, at work up to within a half-hour of his death on November 23, 1932. All the articles originally appeared in the Melbourne *Argus*. They provide pleasant, if not deep reading, and reveal an intense appreciation of the beauty and charm of nature. The article " An English Hedgerow " will particularly please English readers; he clearly understood the secret which accounts for the unique appeal of the English rural scene. G. F. Herbert Smith.

Old Ashmolean Postcards. Oxford Science Series. Men of Science of the 18*th Century.* 6 Cards in monochrome. (Oxford University Press. 1933. 6*d*.)

This packet includes Nos. 54–59 of the series of postcards of the men of science of the 18th century, namely, James Bradley, John Wall, Gilbert White, Thomas Pennant, Edmund Cartwright, and James Sadler. The illustrations are well printed on card of good quality from half-tone blocks.

G. F. Herbert Smith.

Charles Darwin's Diary of the Voyage of H.M.S. " Beagle." Edited from the MS. by Nora Barlow. Pp. xxx + 451. Frontispiece, 2 text-figures, and 2 maps. (Cambridge: University Press, 1933. 21*s*.)

During the voyage of the " Beagle " Darwin kept a diary giving a day-to-day account of his occupations and impressions and of the incidents of the voyage. This diary was written up as opportunity offered, sometimes almost at once, sometimes as much as three or four months after the events it recorded. It was based on the pencil jottings made in small pocket note-books carried by Darwin on his various journeys, and was intended to be read by his father and sisters, to whom it was sent in instalments during the five and a half years of the voyage.

This diary, which occupies eight hundred pages of manuscript, is published in full in the present volume, with an admirable preface and notes by Darwin's granddaughter, Mrs. Nora Barlow.

Curiously enough, one reviewer, misled by a hasty reading of the preface, has supposed that what the volume contains is a transcription of the eighteen "diminutive pocket-books," although it is quite clear from the extracts that are given from them that their rough notes and memoranda were simply the material on which the diary was based.

The diary was written solely for the reading of Darwin's home circle, and, at first at least, without any thought of publication, but it became, in its turn, the basis of the world-famous "Journal of Researches," first published as one of the volumes of the official report on the voyage and afterwards issued separately in two editions and several reprints and translations. Actually, not more than two-thirds of the matter contained in the diary was utilized, with much alteration and condensation, in the "Journal," while the latter was expanded by the inclusion of much detail and discussion drawn from the large separate note-books in which Darwin recorded his geological, ornithological, and other scientific observations. Further, in the "Journal," the strict chronological order is sometimes departed from, as, for instance, in the account of the Falkland Islands in Chap. ix, which combines observations made on two visits with an interval of a year between.

In two appendices to the present volume, references are given to the more significant passages of the diary that are omitted from the "Journal," and to those portions of the latter work that were added by Darwin on publication.

There can be no doubt that it was well worth while to publish the diary in its original form. It may perhaps be said that it adds little of scientific importance to what Darwin himself thought worthy of publication; but of its "human" interest there can be no doubt. If it does not throw much new light on Darwinism it throws a great deal on Darwin. As Mrs. Barlow remarks, "To many readers, Charles Darwin stands as a figure far advanced both in knowledge and in years; this volume contains a picture of him in the first freshness and eager enjoyment of life." To some perhaps the most enduring impression from reading these pages will be of the indomitable courage and endurance of the man, fighting all the time against the agonies of sea-sickness and facing extreme toil, hardship, and danger on his prolonged land-journeys. Not that he himself says much about these things; they have to be sought for between the lines. When, in Tierra del Fuego, the boats, hauled up on the beach, were in imminent danger of destruction, he writes: "One of the seamen just got hold of the boat as the curling breaker reached it; he was knocked over and over but not hurt." It is only from Capt. FitzRoy (quoted by Mrs. Barlow) that we learn: "There was scarcely time for the most active of our party to run and seize the boats before they were tossed along the beach like empty calabashes . . . had not Mr. Darwin and two or three of the men run to them instantly, they would have been swept away from us irrecoverably."

Much has been written about Darwin's sea-sickness and its effects on his health in after-life; one wonders whether there may not be some special significance, from the medical point of view, in a remark towards the end of the diary which does not appear in the published "Journal," "suffering now more than I did three years ago." This was written in 1836, and "three years ago" takes us back, not, as we might have expected, to the beginning of the voyage, but to 1833, off the Horn, and "the worst gale he [Capt. FitzRoy] had ever been in."

At all events we do not find in these pages much trace of the valetudinarian shirker which some American psychologists have compared, to his disadvantage, with the gallant dare-devil Lamarck.

Mrs. Barlow raises a point of considerable importance with reference to the development of Darwin's views on evolution when she calls attention to the importance of Capt. FitzRoy's influence on him. FitzRoy was a devout and almost fanatical believer in the literal truth of the Bible, and they had long discussions on the subject. "Such discussions must have helped to form opinions, but it may well be that overt expression of them was delayed by Darwin's very real affection and admiration for Robert FitzRoy."

W. T. CALMAN.

MUSEUM NEWS.

THE series of special lectures on Monday mornings at 11.30 is being continued as under. Most of them are to be illustrated by lantern slides and will be given in the Board Room, but the venue of some of them will be the Gallery concerned. The real need for a lecture room or theatre, adequate in size and equipment, has been well brought out by these lectures. The only accommodation at present available is the Board Room, the transformation of which to lecture purposes is awkward and hardly a success. Nevertheless, in default of an alternative it has to be used.

February.

5. †Mr. W. Campbell Smith : Rock-forming Minerals.
12. *Dr. W. T. Calman, F.R.S. : Lobsters and Crabs.
19. *Mr. H. W. Parker : Snakes.
26. †Mr. F. A. Bannister : The Colour and Shape of Crystals.

March.

5. *Mr. F. C. Fraser : Southern Whaling.
12. *Mr. J. Ramsbottom, O.B.E. : Dry Rot.
19. *Capt. Guy Dollman : The Animals recommended for Protection in Africa by the International Conference, 1933.
26. *Mr. A. W. Exell : Botanical Collecting in the Gulf of Guinea.

April.

2. Easter Monday. No special lecture. General Tours by the Guide Lecturer at 11, 12, 2.30, and 4.30.
9. *Mr. J. R. Norman : Our Food from the Sea.
16. *Mr. L. R. Cox : Fossilization.
23. *Dr. Susan Finnegan : Scorpions.
30. *Mr. G. Taylor : Plant Adaptations.

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THE Museum was represented by Dr. C. Tate Regan, F.R.S., Dr. G. F. Herbert Smith, Capt. Guy Dollman, and Dr. Percy R. Lowe, O.B.E., on the panel of advisers to the United Kingdom delegation to the International Conference for the Protection of the Fauna and Flora of Africa, which was held in London from October 31 to November 8. The two last named were members of the technical sub-committee which drafted the annex of species to be protected, and Capt. Dollman was joint secretary of it. Many of the delegates visited the Museum after the afternoon session on November 3, and were received in the New Whale Hall by the Earl of Crawford and Balcarres, K.T., on behalf of the Trustees. Among the exhibits arranged for them was a group (Fig. 1) of mounted specimens of some of the animals included in the annex.

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* Lecture in Board Room. † Lecture in Gallery.

FIG. 1.—GROUP OF AFRICAN ANIMALS SCHEDULED FOR PROTECTION, ON VIEW AT THE RECEPTION, NOVEMBER 3, 1933.

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THE old iron building containing the exhibit of whales and dolphins was closed to the public on January 1, and will be pulled down as soon as the contents have been removed to the new Whale building.

Provision was made in the financial year 1895 for the erection of an iron building, measuring 120 feet by 45 feet, with a matchboard lining, as a Whale Room. It was opened to the public three years later, on Whit Monday, May 30, 1898, and has thus been open for nearly thirty-six years. Previously the whales had been shown, under what before the days of electric light must have been very gloomy and unsuitable conditions, in part of the west Basement. That accommodation, moreover, had been congested for many years and the specimens consequently were not shown to advantage. The story of congestion is repeated, the iron building having long been overcrowded; moreover, the building itself has with the passage of time tended to become dilapidated. The site will be used for a lofty block to accommodate the section of the Department of Entomology at present in the extension of the New Spirit Building as well as to provide some expansion for the Department of Zoology.

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A NEW exhibition to illustrate the taxonomy and biology of the ants has been arranged in the Insect Gallery.

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MR. J. E. DANDY, Assistant Keeper, Department of Botany, left England at the beginning of December to join the Oxford University Expedition to the south-west Sudan and the Congo Nile divide and will be away about five months.

ACQUISITIONS.

Department of Zoology.

Collections and photographs secured by Mr. F. C. Fraser, Assistant Keeper, while on a cruise with Col. E. T. Peel on the latter's yacht to the north of Scotland, Shetlands, and Faröe during July, the specimens including dolphins, and young birds and eggs.

An interesting collection of mammals, mostly large ungulates, shot in the Sudan by the donor during his recent expedition to north-east Africa; presented by Major P. H. G. Powell-Cotton.

Mounted specimens (a spider monkey from South America, a head of a female bighorn sheep from North America, a rare white-collared titi monkey from Brazil, and a black-headed uakari monkey from the Amazons); presented by the Rowland Ward Trustees.

A valuable collection of birds, consisting of about 813 skins, made by the donor in the Usambara Mountains, Tanganyika Territory; presented by Mr. R. E. Moreau.

Fine mounted head of an African elephant, shot in Uganda in 1907 by the late Major G. E. M. Norrie; presented by his son, Lieut.-Col. C. W. M. Norrie, D.S.O., M.C.

Mounted specimen of the Havana breed of rabbit; presented by Mr. G. V. A. Andrews.

A large collection of big game trophies from Africa and Asia, shot by the late Major P. K. Glazebrook; presented by Mrs. Armitstead.

A collection made by Mr. F. Shaw Mayer, consisting of 170 mammals, from New Guinea; purchased.

Skeleton of a fine sea-elephant from South Georgia; purchased.

Department of Entomology.

Dr. Oscar John's collection of thrips; purchased.

A collection of about 8500 insects, chiefly butterflies and moths, made in Malaya by the late Mr. A. R. Sanderson; purchased.

Department of Geology.

A slab, 8 feet high, containing a reconstructed group of palm leaves from the Tertiary beds of Italy; presented by Lord Rothschild, F.R.S.

A collection of British fossil vertebrates formed by the donor, including Eocene mammalian and bird remains from the Isle of Wight and Liassic reptiles from Dorsetshire and Yorkshire; presented by Mr. S. L. Wood.

Portion of a limb-bone of Grévy's zebra from the Middle Pleistocene of Olduvai, East Africa, collected in 1913 by the donor and found to be the other portion of a broken bone collected in 1931 by Dr. A. T. Hopwood, Assistant Keeper; presented by Prof. H. Reck.

Upper Jurassic ammonites collected by the donor from the Island of Skye; presented by Mr. M. MacGregor.

A new type of sessile bivalve from the Upper Lias of Oregon, U.S.A.; presented by Dr. E. L. Packard.

A series of plant fructifications from Triassic rocks of South Africa, recently described by Dr. H. Hamshaw Thomas; purchased.

Specimens of fungus-gnats and small flowers in amber from the Baltic; purchased.

Department of Mineralogy.

Large series of rocks and minerals collected by Mr. W. Campbell Smith, Deputy Keeper, in the United States and Canada, and selected by him from the duplicates of the United States National Museum and the United States Geological Survey.

A valuable series of books on precious stones, including "De lapidibus pretiosis enchiridion" (1531) written in Latin verse by Marbode (1036–1123), Bishop of Rennes; presented by Mr. E. Heron-Allen, F.R.S.

A nice crystal of diamond, embedded in blue ground from the old open workings of the De Beers mine at Kimberley, which was given by Cecil Rhodes to the donor's father, George Hudson, then Treasurer-General of Griqualand West, on the occasion of the amalgamation of the De Beers Diamond Mines in 1888; presented by Mr. W. T. Hudson.

A series of minerals from newly-discovered occurrences, including large crystals of orthite and ægirine, corundum, nickel-bearing magnetite, gold in cellular quartz, and "cave pearls"; presented by the Director of the Geological Survey of Tanganyika Territory.

Crystallized sprays of native gold from the City Deep mine, Witwatersrand; presented by the Directors of the Central Mining Investment Corporation, Ltd.

Volcanic agglomerate from the crater of Lake Bosuntwi, Ashanti; presented by the Director of the Geological Survey of the Gold Coast.

Further specimens of transparent, pale yellowish silica-glass, the largest piece weighing 2279 grams (5 lb.), from the Libyan Desert; presented by the Director of the Survey of Egypt.

Tektites (billitonites) from Billiton, Dutch East Indies; presented by Engineer R. J. van Lier.

A large series of moldavites (tektites) from southern Bohemia and western Moravia; exchange.

New uranium minerals from the Radium Mines in the Belgian Congo; exchange.

A fragment from a new stony meteorite from West Siberia; exchanged.

A faceted, brownish-yellow danburite, weighing 2·246 grams (11·23 carats), from the Ruby Mines, Mogok, Upper Burma; purchased.

Chinese carving in fluorspar; purchased.

Department of Botany.

A collection of about 1000 different plants formed by Mr. A. H. C. Alston, Assistant Keeper, who, accompanied by Mr. N. Y. Sandwith, of the Royal Botanic Gardens, Kew, visited southern Albania in the summer of 1933.

Many interesting species of seaweed collected by Mr. G. Tandy, Assistant Keeper, while on a scientific visit to Dry Tortugas, Florida, in the summer of 1933.

The herbarium of the donor's grandfather, Dr. Edward Ballard, F.R.S. (1820–1897), containing nearly 700 plants; presented by Mr. N. A. Macintosh.

About 1000 specimens of British brambles, collected by the donor; presented by Col. A. H. Wolley-Dod.

About 900 plants collected by Mr. T. G. Tutin, in the course of the Cambridge University expedition to British Guiana in 1933; presented through Dr. G. C. Carter, leader of the expedition.

The herbarium of Philip Sewell (1865–1928), containing about 3000 sheets of British plants chiefly from the Cleveland district of Yorkshire; presented by Mrs. H. G. Sewell.

The important herbarium, containing about 40,000 sheets, formed by the testator; bequeathed by the late Mr. C. C. Lacaita.

AFRICAN ANIMALS REQUIRING PROTECTION.

Pigmy Hippopotamus,
Chœropsis liberiensis.
Madagascar Lemur,
Lemuridæ.

Colobus Monkey,
Colobus.

Gorilla,
Gorilla gorilla.

Chimpanzee,
Anthropopithecus troglodytes.
Madagascar Lemur,
Indrisidæ.

Jentink's Duiker,
Cephalophus jentinki.
Madagascar Lemur,

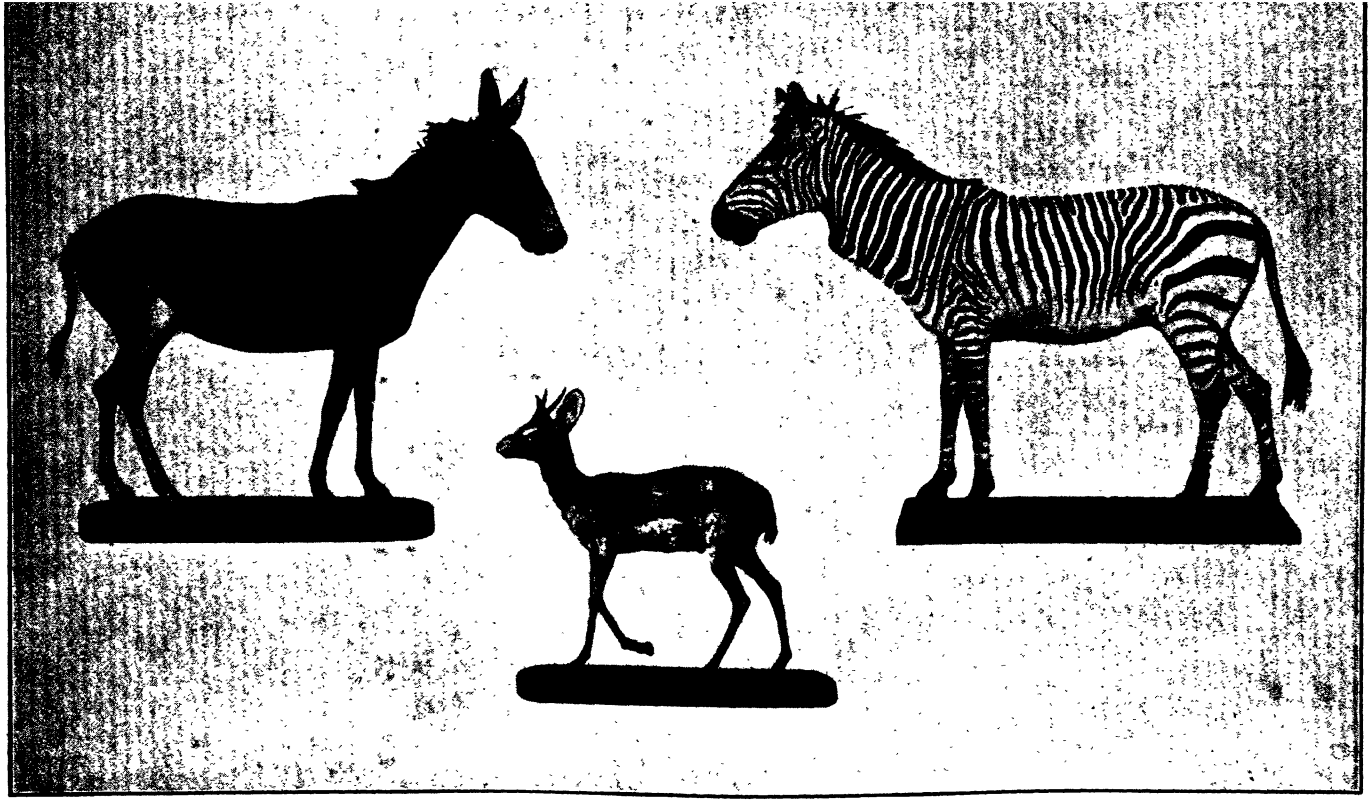
AFRICAN ANIMALS REQUIRING PROTECTION.

Okapi, *Okapia johnstoni.*

Water Chevrotain, *Hyemoschus aquaticus.*

Nyala, *Tragelaphus angasi.*

It should be noted that the illustrations differ in scale.



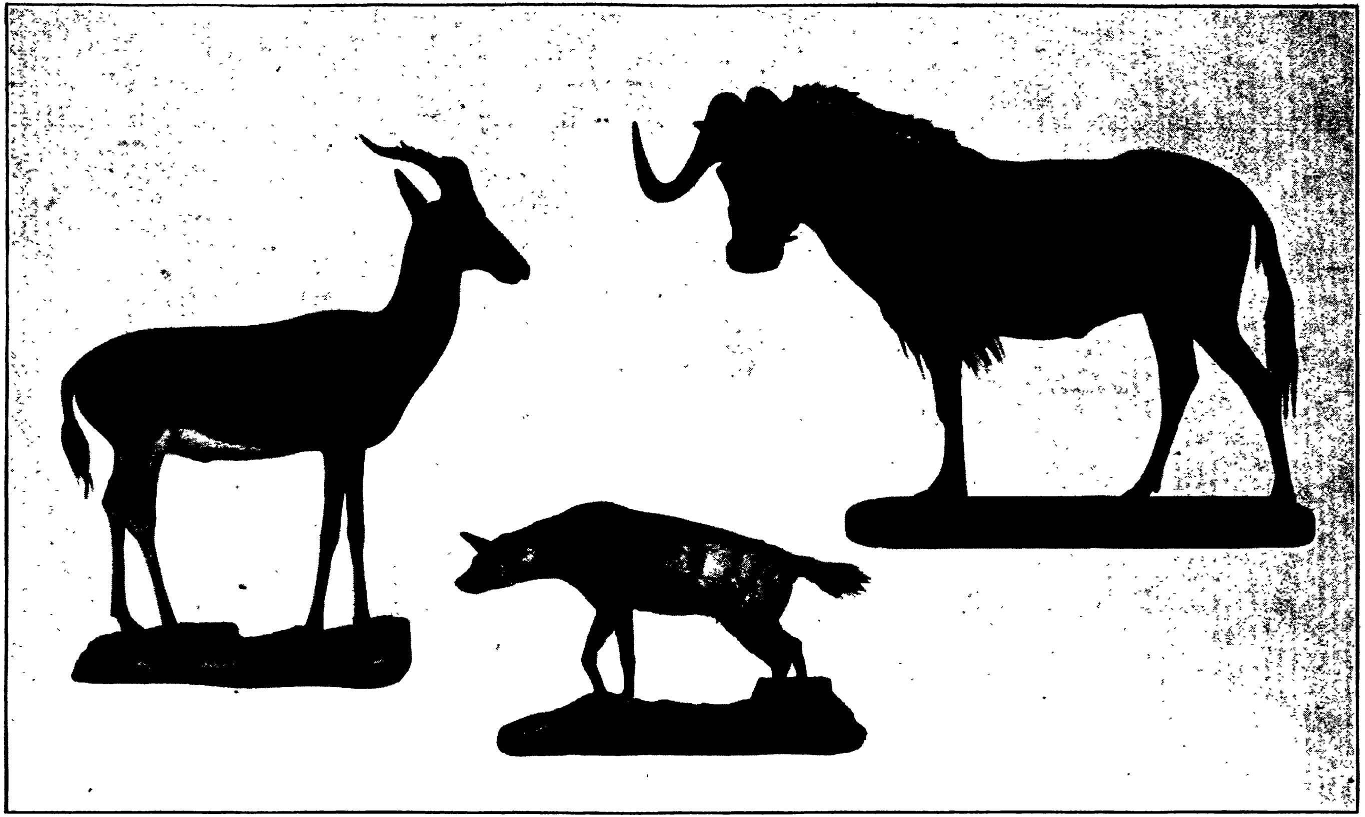
AFRICAN ANIMALS REQUIRING PROTECTION.

Wild Ass,
Asinus asinus.

Beira,
Dorcatragus megalotis.

Mountain Zebra,
Hippotigris zebra.

It should be noted that the illustrations differ in scale.



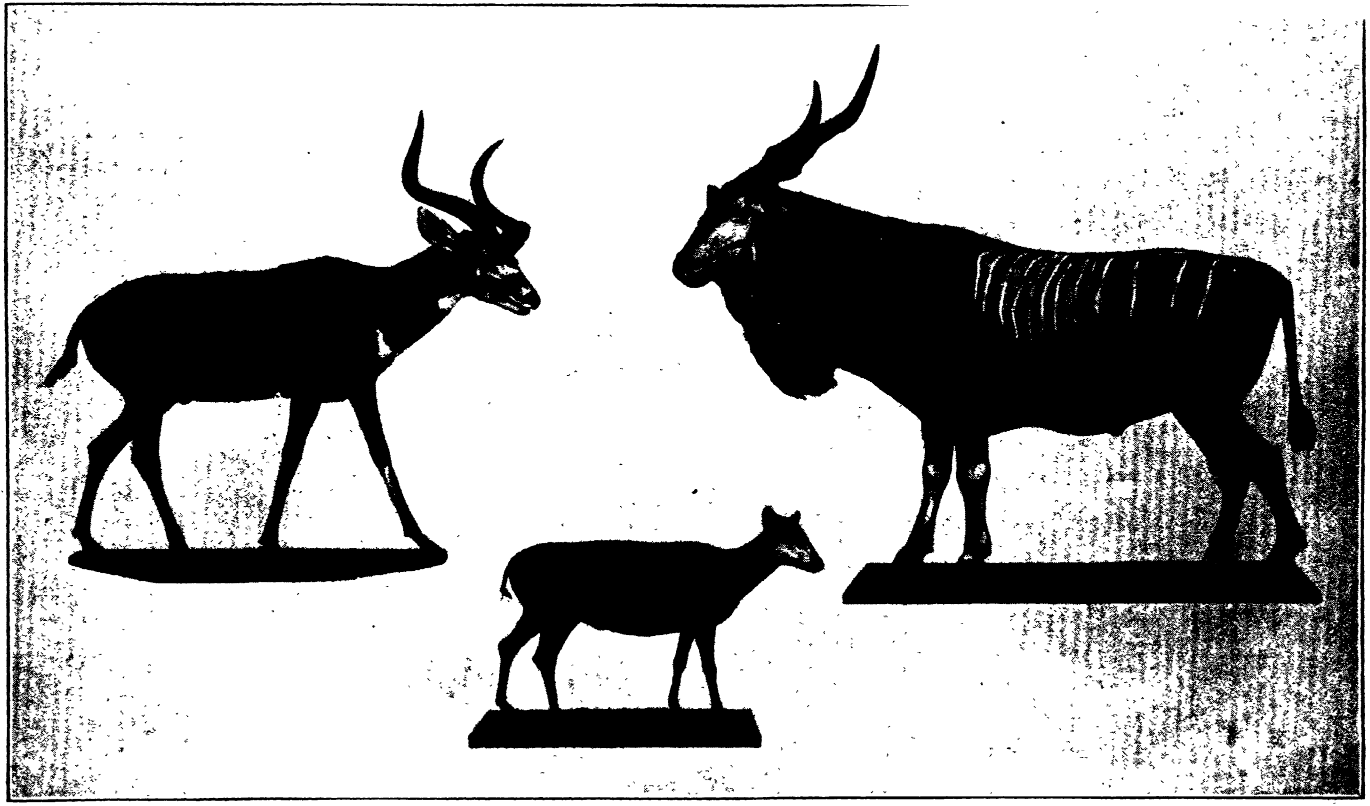
AFRICAN ANIMALS REQUIRING PROTECTION.

Bontebock,
Damaliscus pygargus.

Aard Wolf,
Proteles cristatus.

White-tailed Gnu,
Connochætes gnou.

It should be noted that the illustrations differ in scale.



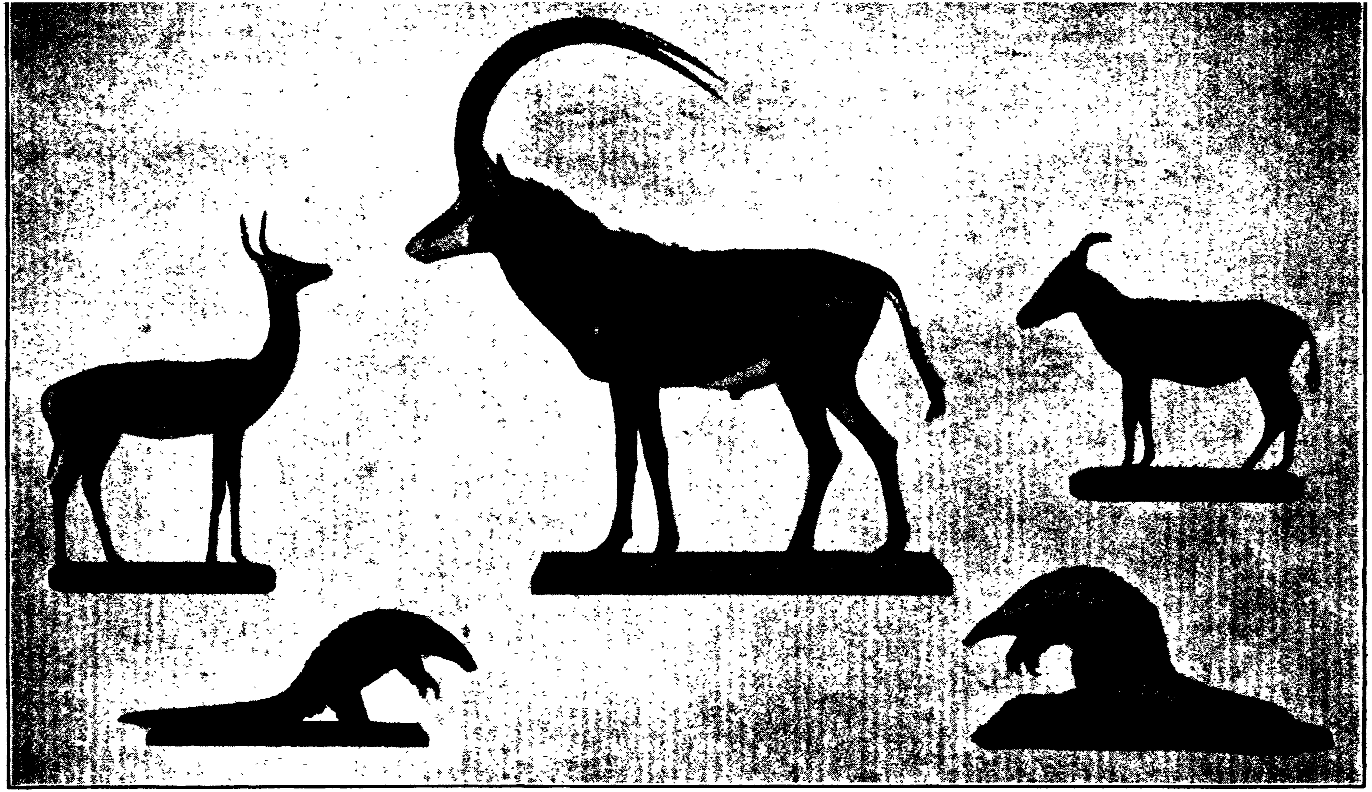
AFRICAN ANIMALS REQUIRING PROTECTION.

Mountain Nyala or Buxton's Bushbuck, *Tragelaphus buxtoni*.

Yellow-backed Duiker, *Cephalophus sylvicultrix*.

Giant Eland or Lord Derby's Eland, *Taurotragus derbianus*.

It should be noted that the illustrations differ in scale.



African Animals requiring Protection.

Dibatag or Clarke's Gazelle,
Ammodorcas clarkei.

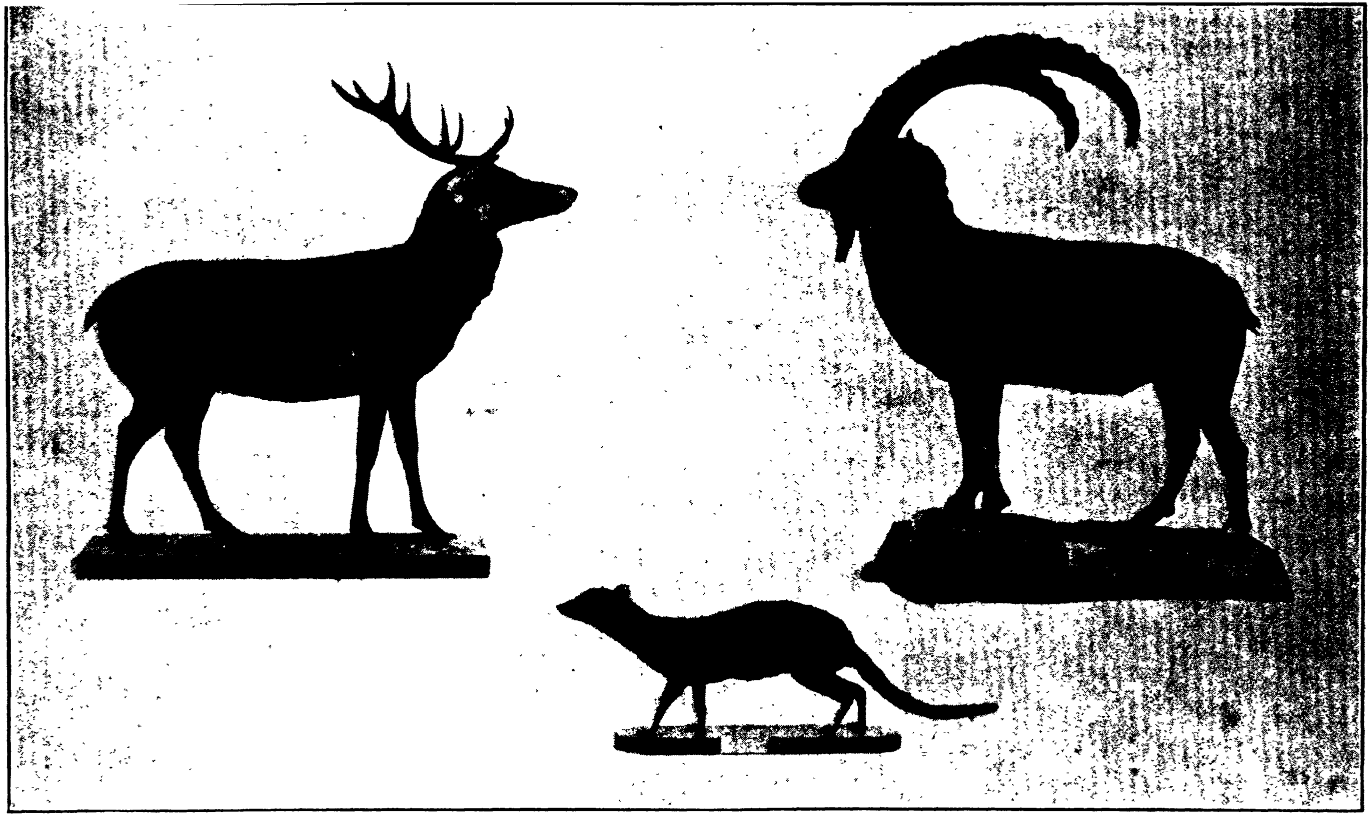
Giant Pangolin,
Manis gigantea.

Giant Sable Antelope,
Hippotragus niger variani.

Northern Hartebeest or Bubal,
Bubalis buselaphus.

South African Pangolin,
Manis temminckii.

It should be noted that the illustrations differ in scale.



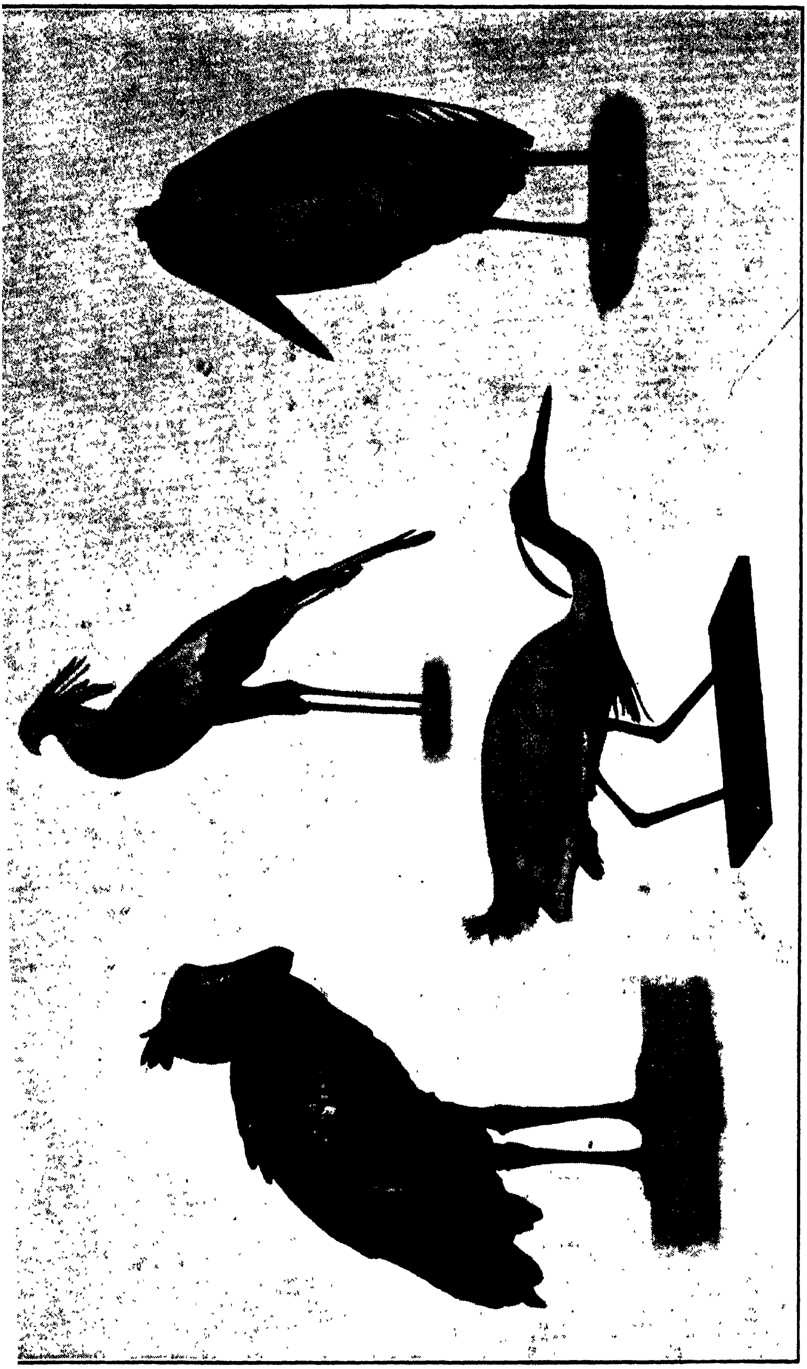
African Animals requiring Protection.

Barbary Stag,
Cervus elaphus barbarus.

Fossa,
Fossa fossa.

Abyssinian Ibex or Wali,
Capra walie.

It should be noted that the illustrations differ in scale.



AFRICAN ANIMALS REQUIRING PROTECTION.

Whale-headed Stork or Shoe-bill,
Balæniceps rex.
Photograph by D. Seth Smith.

Secretary Bird,
Sagittarius serpentarius.
Little Egret,
Egretta garzetta garzetta.

Marabou,
Leptoptilos crumeniferus.
Photograph by D. Seth Smith.